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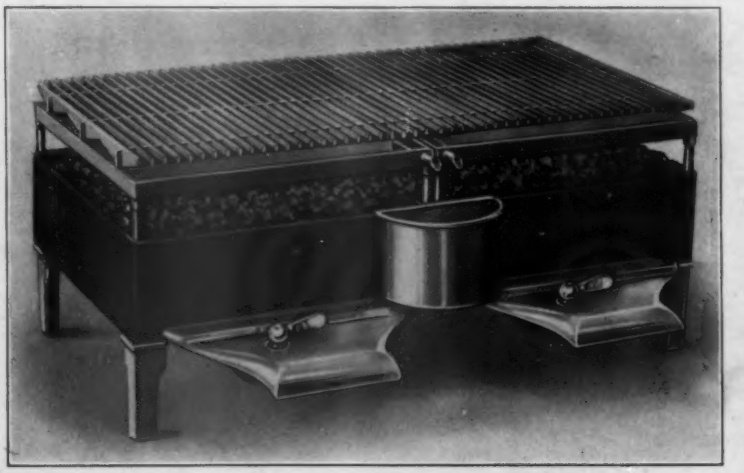

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Manufactured and Natural Gas

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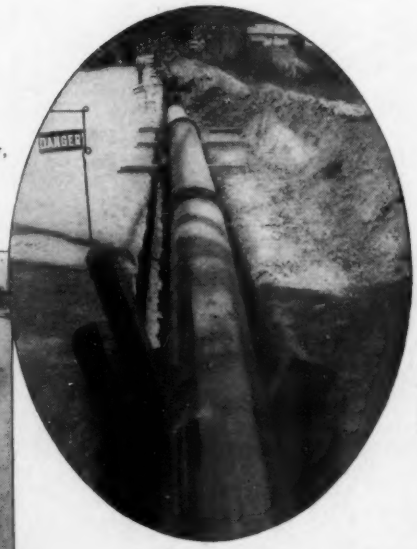

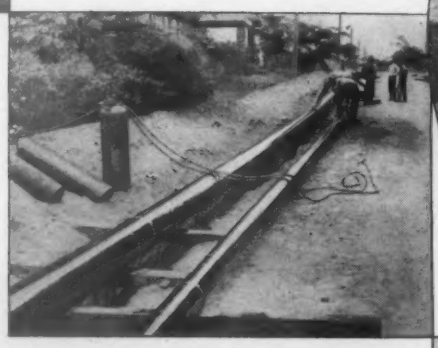

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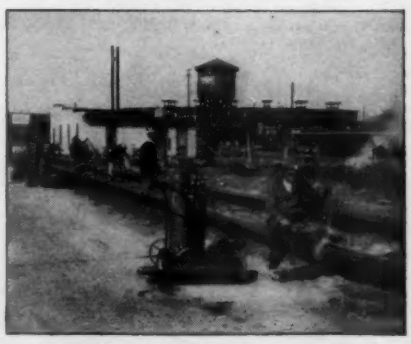

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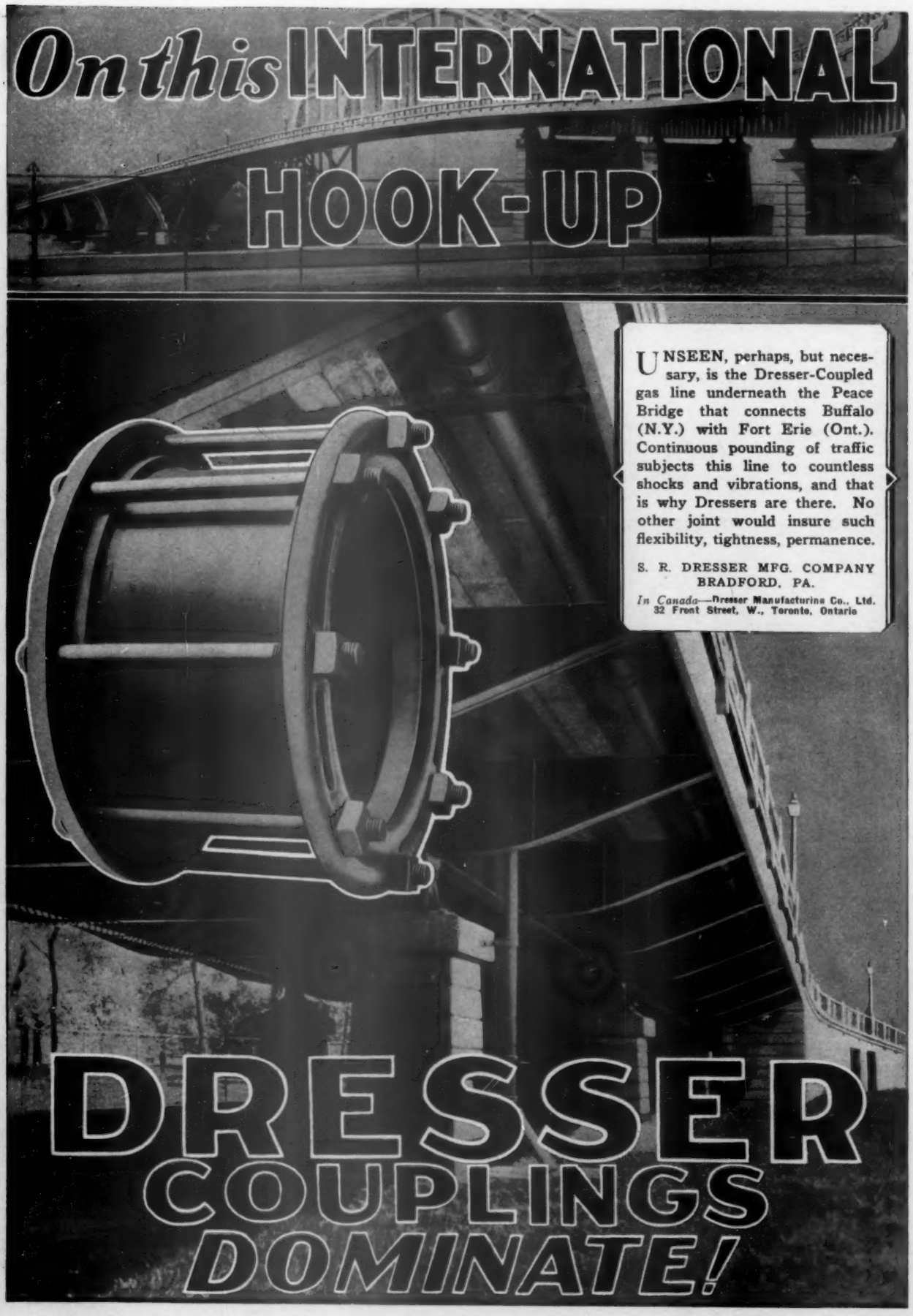
On this INTERNATIONAL
HOOK-UP
UNSEEN, perhaps, but necessary, is the Dresser-Coupled gas line underneath the Peace Bridge that connects Buffalo (N.Y.) with Fort Erie (Ont.). Continuous pounding of traffic subjects this line to countless shocks and vibrations, and that is why Dressers are there. No other joint would insure such flexibility, tightness, permanence.
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As We See It

Facing Holding Company Problems

PUBLIC utilities face no greater management problem today than the one involved in holding company ownership of operating utilities. This many sided problem has been made the more acute by the actual or threatened collapse of some of these financial enterprises which were unable to adjust themselves with sufficient rapidity to meet changing economic and financial conditions. The problem has been made more conspicuous by the frequent, and unfortunately at times justified, criticism of holding company managements. These enterprises are often accused of "syphoning profits" out of the operating company or of placing "unwarranted and burdensome service charges" on the subsidiary.

Generalizations as to the proper relation between holding company and subsidiary are dangerous. And there exists no panacea to correct all of the ills involved in these organizations. But it is futile to play ostrich and attempt to evade the fact that the problems exist or to deny the fact that they are both serious and pressing.

Wisdom is gained best by experience. And surely we have now much experience in holding company enterprises. From this experience each company must undertake to gain for itself the maximum of wise program and the earliest possible adjustment of fiscal relations into a sound and enduring form. Schemes that were effective and fair during periods of steady growth on the part of every utility activity may have become inequitable or unworkable, or both, in times of stagnant or restricted business. An adjustment to the new order is, therefore, essential.

The holding company properly organized and with proper relationships to its subsidiaries serves a valuable function. Its economic success should not be questioned simply because some badly organized groups have proven unworkable. The holding company is going to survive the present crisis in superior form prepared to render greater service of value not only to its subsidiaries but also both to the user public and to the stockholder. Those who generalize in condemnation of parent enterprises because of the parental failures in single cases cannot justify their stand.

But managements of both the parent company and the operating enterprise must cooperate to secure for *all* branches of the corporate family the benefits of sound relationship, free from the stigma of official or public ill will. Furthermore, it should be recognized that not alone is evil to be avoided. Merely the appearance of evil is likely to be a sin in the eyes of the public. Extreme care must, therefore, be taken and great frankness accorded to the public to insure the retention of all the legitimate benefits of the holding company enterprise in our industry.

A Good Omen

DURING the Convention and Exposition of the National Association of Master Plumbers at Madison Square Garden in New York last month there were in evidence many features that were of considerable interest to the gas industry. Thus, our industry supplied one of its outstanding figures in merchandising matters and commercial relations, Oscar H. Fogg, who delivered an important address. Fancy a prominent gas official being attentively listened to at a meeting of plumber folks even as recently as five or so years ago. Times do move.

Again, one could scarcely stifle a hugeous show of pride in the many exhibits of gas appliances and the prominent gas men in attendance, to say nothing of the crowds who visited these booths as well as the excellent publicity display featured by American Gas Association. We must confess, however, that we personally got the biggest "kick" by way of visiting some of the gas displays under the guise of plumber folks and having the manufacturers explain their wares to us. Incidentally, legitimate dealers were frequently at hand for these "talk-fests" and demonstrations and it warmed the cockles of our heart to hear the good things said about gas service and gas appliances. We confess a swelling out of the chest on account of the experience. It was heartening to learn that the plumbers are quite sold on approved appliances and recognize that the gas companies are their earnest allies. And, take our word for it, the former seem to be catching on to this merchandising game most thundering fast.

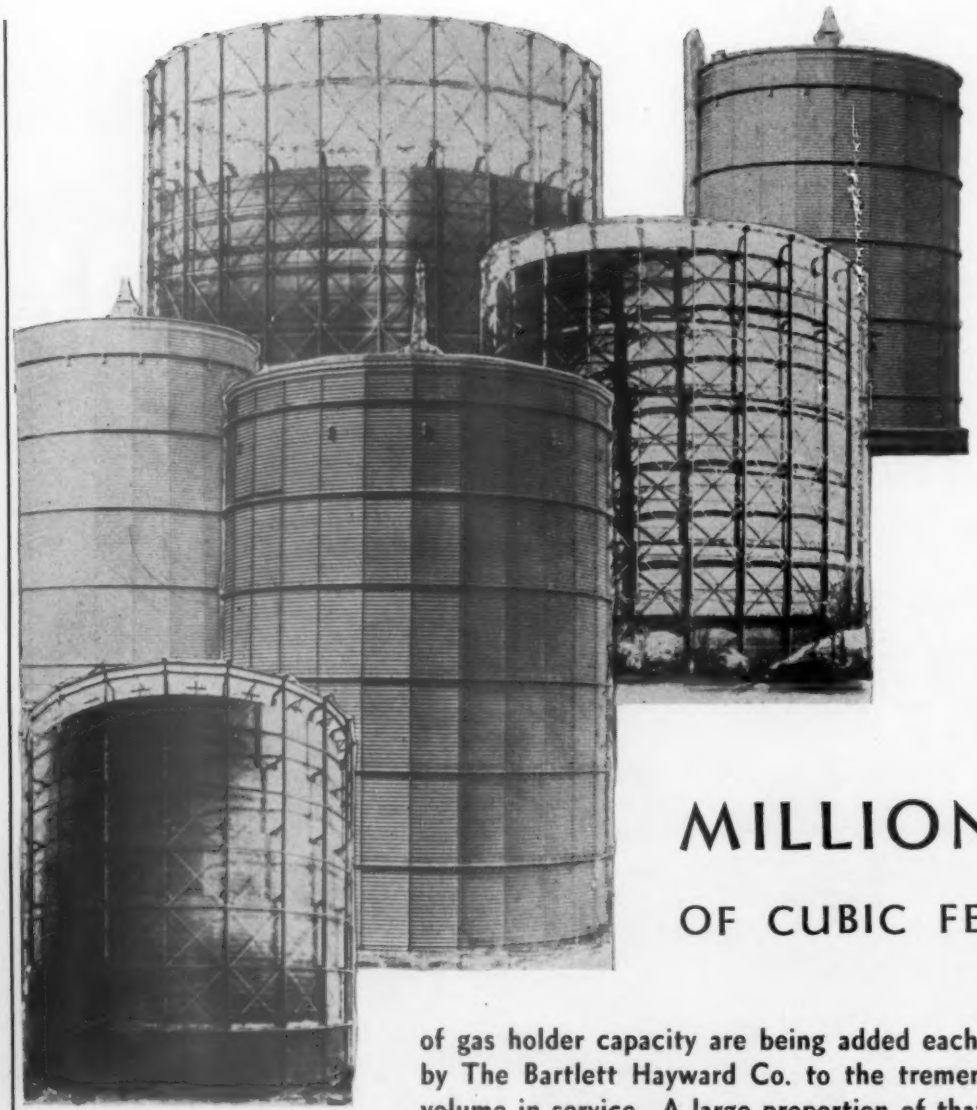
"Wipe Your Boots and Do Not Stand in the Bath"

THIS good advice is offered as the title to a public relations summary in our contemporary The Gas World, of London. As a title it is effective; as advice it is excellent.

Since American gas companies do not have "geysers" for water heating suspended English fashion over the bath tub, we assume that there is little temptation for American company fitters to take their boots into the bath tub with them.

But advice on points like these should not be limited to the fitters working on appliances in customers' premises. Similar advice applies particualrly well to foremen and even individual ditch diggers in the distribution department. These men, inadequately supervised, often get careless and needlessly muss up front lawns, sidewalks, and driveways to the customer's home. It would be a good thing during this season of distribution work to put on an anti-stupidity campaign. The objective, of course, would be to eliminate needless annoyances, both to customers and to passing traffic. Just a little bit of prearrangement is worth a score of apologies afterwards. There are many things besides muddy boots in bath tubs which can be eliminated by the thoughtful department manager.

Truly, good public relations are at times influenced by seeming trifles.



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Vol. 137 No. 1
July, 1932

AMERICAN
GAS JOURNAL
Established 1859 Pioneer of the Gas Industry

HENRY M. RILEY
Editor

Ten Years of Gas Purification

A presentation of the subject from the operator's point of view—based on records and data obtained at the Lowell plant.

R. C. DOWNING
Supt. of Mfr., Lowell Gas Light Company,
Lowell, Mass.

Fig. 1—Outside of Purifying House

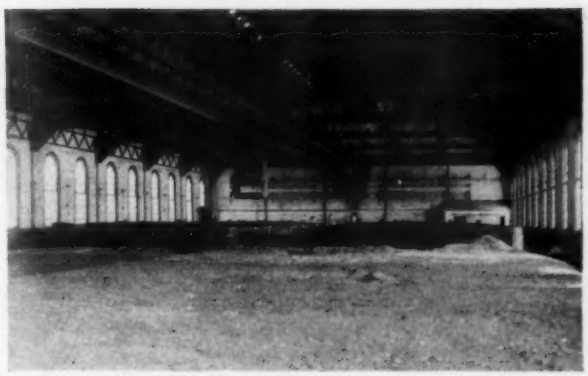


Fig. 2—Inside of Purifying House

(Continued from June issue)

Evaluation of Spent Oxides

THE term "efficiency of ferric oxide" has been used consistently throughout this article and in the tables. Perhaps it should be briefly explained, as it is not a term commonly in use. A unit weight of hydrated ferric oxide ($Fe_2O_3 . 3H_2O$) will absorb theoretically 0.6 of its weight of hydrogen sulphide when no oxygen is present. If the ferric oxide in a sample tested will absorb 0.3 of its weight of hydrogen sulphide, it is said to be 50% efficient. The term is in reality an indication of theoretical capacity and in no way designates the rapidity of hydrogen sulphide absorption or activity.

One can calculate the efficiency of ferric oxide in a purifying material by the formula. Efficiency = AD — BC /0.6 AC, where A is % Fe_2O_3 in material before fouling; B, the per cent sulphur in the original material; C, per cent Fe_2O_3 in fouled material, laboratory test, and D the per cent sulphur in fouled material, laboratory test. Experience with the method leads to the belief that an oxide may be used with economy until the efficiency reaches about 20% of its original efficiency. Theoretically, an oxide should be discarded when the labor cost of revivification per bushel is greater than the cost of the original oxide multiplied by the reduction in efficiency of the oxide.

If the labor cost per bushel necessary to break up lumps and revivify the oxide is known, together with the efficiency of the spent oxide as compared with the original oxide, it is a simple matter of arithmetic to determine whether to reject or reuse the batch. For example, if an oxide cost 30c per bushel, and its ferric oxide tested 60% efficient when new, and 10% when taken from the box, the spent oxide would have a value of 1/6 of 30 or 5c as compared with the new oxide.

Now as long as the labor cost to turn it is 5c or less, it is a profitable practice to use the material again. If the labor cost of revivification, is only 3c, a saving of 2c per bushel will be made by continued use of the oxide and the money required to buy a new batch need not be forthcoming until the next change period of the batch. In drawing conclusions, due allowance must be made, of course, for the accuracy of sampling and testing and a tolerance of at least 10% allowed.

This efficiency method is not new; it is simply another way of expressing the repeated fouling tests made by some laboratory.

A red ore has been known to be fouled as many as

fifteen times. In the first fouling the material absorbed 25% of its weight of sulphur. After the fifteenth fouling, the original material was still absorbing 12.5% of its weight and contained more than 70% of sulphur. In this laboratory test, the material had only one-half its original efficiency after the fifteenth fouling. In plant practice such an experience is not realized as the efficiency of the material reduces much more rapidly.

Oftentimes, many other considerations affect the decision to reject a spent oxide, other than the efficiency of its ferric oxide. At Lowell, the desire to eliminate naphthalene trouble and later to rearrange the gas flow system in the boxes led to discarding oxides before they had served their entire useful life as predicted by the efficiency test just described.

In passing, it is of interest to note that these natural bog ores did not seem to absorb sulphur as satisfactorily on the first use in the box as they did after revivification. Only 5 to 7 lbs. of sulphur were absorbed per bushel on the first fouling whereas on later use, this figure increased to more than 20 lbs. per bushel. A marked improvement in the cost of the material used per million cubic feet of gas purified also resulted with the use of bog ore. Iron boring purification cost on the average about $1.00 per million cubic feet purified. Bog ore mixed with shavings cost about 50c per million and raw bog ore unmixed, about $2.40 per million feet.

Purification with Commercial Oxides

After the natural ore had been successfully used it was decided that it would be interesting to try out batches of commercial oxide. However, it became necessary to open a box in the early part of 1925 and as the contemplated batch of "Y" oxide was not ready, some rusted boring sponge oxide was purchased with the thought of getting additional information as to its value. Unfortunately, the amount purchased was not sufficient to more than fill the lower half of the box because of excessive shrinkage during shipment and "Y" material was used in the upper compartment. The history of this mixture is given as Batch No. 10 and shown in Table Number Five. When the box was opened, the two layers were carefully separated and samples taken from each.

The analysis of the spent oxide indicates that the ferric oxide in both of the materials did approximately the same amount of work. The sulphur to ferric oxide ratio for "Y" material was 1.4 and 1.56 for the rusted borings. However, the efficiency of the iron boring oxide decreased from 28.6 to 3.52, the spent having only 12.3 per cent the value of the original material, while the "Y" oxide decreased from 53.4 to 35.68 and the spent oxide was 67% as valuable as the new batch. The original sample of rusted borings contained 15% more ferric oxide than the "Y" material.

The "Y" material cost 19.2c per bushel as mixed and the iron sponge cost 33c on the oxide floor.

Batch No. 11 tells the story of "X" oxide and No. 12 of a second and complete box of "Y" material. Neither of these first two oxides were used to capacity before discarding. The "Y" material batch is airing now and will be used again. About 2,000 bushels of the "X" material batch were transferred to other boxes prior to discarding. The box in which this oxide was working happened to be first in the series for a period of about three months after a multiple oil washer was installed directly before the boxes for naphthalene removal. As there was no oil separator included, considerable oil was carried over into the boxes. This is indicated by 17.6% oil and tarry matter in the oxide as compared to 12.6% free sulphur.

Mention is made of this condition because it undoubtedly shortened the life of the "X" oxide. It was considered that 285,240 cu. ft. of gas passed per bushel was a sufficiently good record and the material was not used again.

Preparation of Materials

The conclusions as to the relative costs of purification with various materials are all based on the cost per bushel of material prepared and it may be in order to state briefly what the experience has been in preparing oxides. Prior to 1925, very little accurate accounting was kept of the mixing costs. It was known, however, that the cost of preparing the rusted borings exceeded 30c per bushel. Later, a very accurate record was kept of the cost of mixing borings with shavings. The labor cost to prepare 1,000 bushels was 21c per bushel,

Table No. V—Purification with Artificial Oxide

Batch Number	No. 9			No. 10				No. 11		No. 12	
	1st Use	2nd Use	Total	1st Use		Total		1st Use	Total	1st Use	Total
Kind of Oxide	Bog ore—13% Iron borings—12%	Red ore—38% "Y" purifying material—37%		"Y" purifying material—50% Rusted borings—50%				"X" purifying material		"Y" purifying material	
Lbs. of material per Bu.	20	20	20	18.4 "Y" purifying m't'l		48.8 Rust		30	30	31	
Used in Box No.	1	3		2				2		4	
No. Bu. into Box	6720	6720	6720	6720				4720		7680	
Date Into Purifier Box	12/22/24	1/16/28		2/18/25				10/21/27		11/6/28	
Date Out of Purifier Box	8/23/26	3/24/31		10/14/27				3/17/30		9/13/31	
No. Days in Service	609	1152	1761	970		970		877	877	1041	
Gas Tests											
Ave. H_2S at inlet to Purifiers Grs./100	116	138		122				124		160	
Ave. % O_2 at Outlet of Purifier	.7	.9	.8	.9				1.0		.9	
Total Lbs. Sulphur Absorbed	148648	157674	306322	151627		151627		114099		164894	
MCF Gas Passed	1361183	2544755	3905938	2135922		2135922		1916813		2263060	
MCF Gas Purified per Bu. per Change	202556	378684	581240	317845		317845		285240		294669	
Lbs. Sulphur Removed per Bu.	22.1	23.5	45.6	22.6		22.6		24.2		21.4	
Spent Oxide Tests			Original material	"Y" purifying material	Borings	"Y" purifying material	Original Borings		Original		Original
% Free Sulphur In—Oxide	28			29.4	24.4				12.6		
% Total Sulphur In—Oxide	36.1	51.7		41.0	33.8	49	.62		34.02 .36	39.48	.2
% Tar & Oil—Oxide	14.2			12.3	13.9				17.6		
Efficiency FE_2O_3 in Oxide	27.2	——	33.45	15.2	3.52	53.4	28.6		32.1 68.0	4.39	62.8
% FE_2O_3 in—Oxide	15.86	12.1	——	29.40	21.44	36.0	51.29		15.13 33.55	21.1	71.5
% FE_2O_3 in Lab. Fouled—Oxide	15.62	——	——	22.21	19.96	29.7	42.0		27.74	20.6	56.78
% S in Lab. Fouled Oxide	38.20	——	——	51.23	35.68	9.7	5.77		11.60	39.64	21.52
Ratio of TS/FE_2O_3	2.28	4.30	4.3	1.40	1.56	.326	.137	2.26	.419	1.86	.380
Lbs. FE_2O_3 per Original Bu.	9.1	9.1	9.1	10.0	21.6	10.0	21.6	10.2	10.2	10.0	10.0
Lbs. Sulphur Absorbed per Bu.	20.7	18.4	39.1	14.0	33.7	2.15	3.42	23.1	4.28	18.6	
				Ave. 23.9							
Costs—For Materials Only				"Y" purifying material		Borings					
Per Bu. of Mixed Material			$0.260	$.194		$.330			$.338		$.272
Per Million Ft. Gas Purified			0.447	.611		1.042			.833		.923
Per Lb. of Sulphur Removed			0.0057	.0139		.0098			.0140		.0127

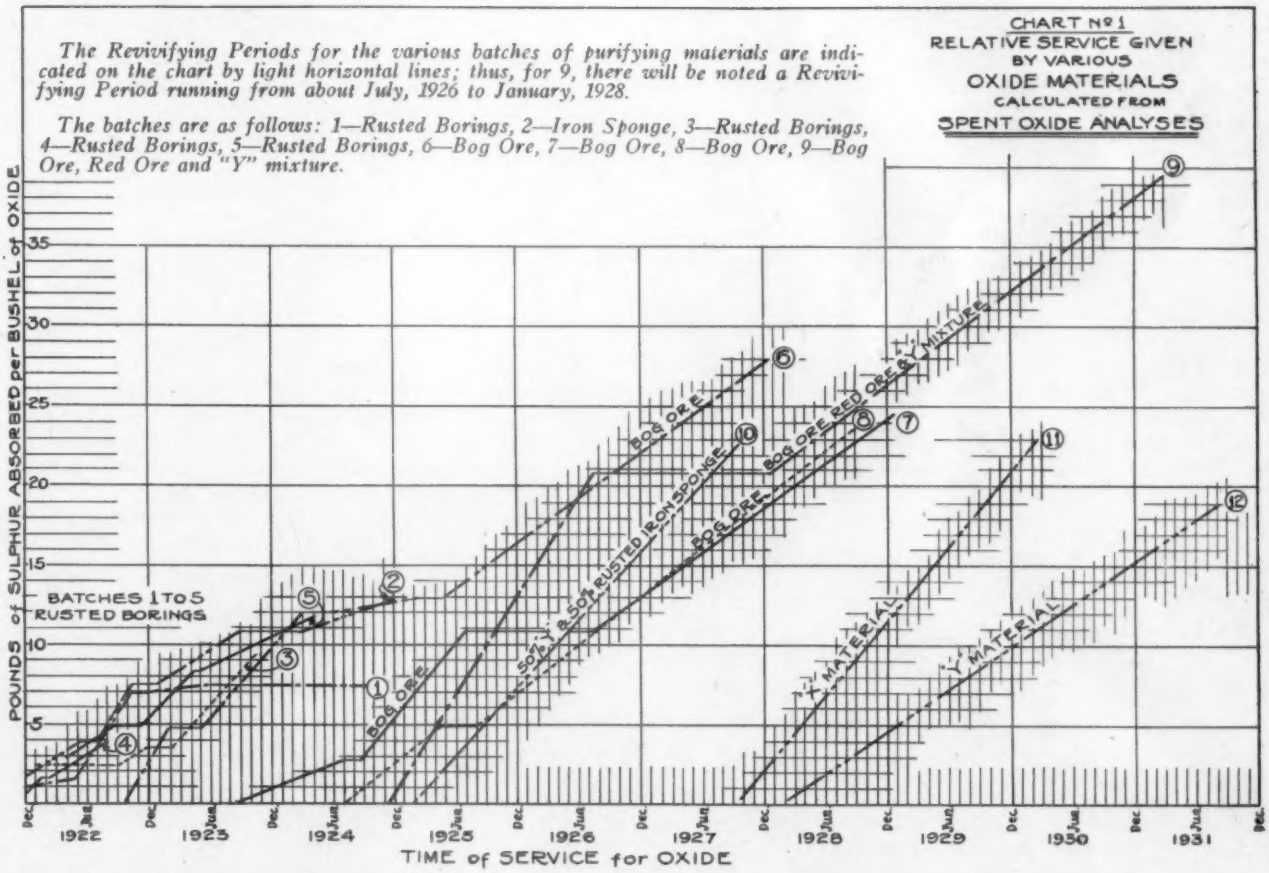


CHART No 1
RELATIVE SERVICE GIVEN BY VARIOUS OXIDE MATERIALS CALCULATED FROM SPENT OXIDE ANALYSES
The Revivifying Periods for the various batches of purifying materials are indicated on the chart by light horizontal lines; thus, for 9, there will be noted a Revivifying Period running from about July, 1926 to January, 1928.
The batches are as follows: 1—Rusted Borings, 2—Iron Sponge, 3—Rusted Borings, 4—Rusted Borings, 5—Rusted Borings, 6—Bog Ore, 7—Bog Ore, 8—Bog Ore, 9—Bog Ore, Red Ore and "Y" mixture.
POUNDS of SULPHUR ABSORBED per BUSHEL of OXIDE
35
30
25
20
15
10
5
BATCHES 1 TO 5 RUSTED BORINGS
BOG ORE
50% R 50% RUSTED IRON SPONGE
BOG ORE
BOG ORE RED ORE & "Y" MIXTURE
"X" MATERIAL
"Y" MATERIAL
1922
1923
1924
1925
1926
1927
1928
1929
1930
1931
TIME of SERVICE for OXIDE

shavings cost 3c per bushel and 20 lbs. of iron used per bushel cost 4.6c making the total cost 28.6c.

Accurate accounting records were kept of the cost to prepare later batches making use of a concrete mixer to mix the oxide with shavings. Labor costs are low and material costs are higher with natural and precipitated oxides. Table Number 5 A shows the split-up of comparative costs.

Table Number V-A—Cost of Preparation for Various Oxide Sponge

	Cents per Bushel					
	Labor	Shavings	Oxide Material	Power	Total	Remarks
Rusted Borings	21.9	3.5	4.6	—	30.0	Hand turned
Bog Ore	8.5	3.0	14.1	.2	25.8	Concrete mixer
	8.3	3.0	14.5	.2	26.0	
"X" purifying material..	8.37	3.0	22.33	.1	33.8	Concrete mixer
"Y" purifying material..	6.10	3.0	18.0	.1	27.2	Concrete mixer
	7.20	3.0	19.3	.2	29.7	
	6.60	3.05	24.25	.1	34.0	

In preparing the sponge from bog ore and precipitated oxides, it is quite necessary to screen the material before it is shoveled into the mixer. Failure to do this will result in lumps of the material ranging from the size of marbles to golf balls. The purpose in mixing is to coat the shavings to get better absorption. The solid lumps will sulphide only on the surface and considerable waste of material results. It was found to be a better practice to first wet about half of the shavings in the mixer, then add the material and finally the last half of the shavings, wetting down with water as required to get the proper adhesion of material to the shavings.

Two men can mix about 300 bushels per day with ease. Comparatively low labor and power cost are the advantages of this method of preparation.

Figure I shows the outside of the purifying house with concrete mixers used for preparing the oxide, also several piles of spent oxide. The close proximity of the railroad siding facilitated the disposal of the spent material when straight bog ore was used.

Figure II illustrates the equipment for handling oxide. The writer does not recommend this type of equipment because of the high investment, fixed charges and maintenance expense. It is of advantage, however, in reducing labor charges for turning oxide and for loading trucks for the disposal of spent oxide and for discharging or filling boxes.

In the foreground, a batch of oxide (No. 12) is shown in process of revivification. The hard paved floor is excellent for this purpose. It has also been found advantageous to use a road roller and pavement digger for breaking up the hard lumps. A company of moderate size will have such equipment.

Disposal and Regeneration of Spent Oxide

The disposal of spent oxide is a vexatious problem for many gas plants. Because of the possibility of fires starting through the heat generated by revivification, it is necessary to hold the spent material at the plant until this danger is past. As soon as city authorities learn of this menace the material is prohibited at public dumps. Continuous storage on gas works land eventually becomes impossible. The material makes excellent filling for roads or private property when properly handled. It should be covered with ashes or dirt immediately to prevent the access of air and consequent combustion.

Experience has taught the advisability of prohibiting

its use in residential or business communities or as a filling any place where it is desired to grow grass or vegetation. The plant is indeed fortunate which has a place to store this spent oxide and doubly so if a transportation company will agree to remove it without charge because of its value as a filling material.

Many attempts have been made by chemists and much thought given to the restoration of oxides to their original condition. Economic conditions in the form of cheap sulphur and iron eliminate such procedure as operating possibilities. During the war years the writer was connected with a spent oxide research in the midwest which advanced from the laboratory to a semi-commercial stage, but was eventually abandoned because of operating difficulties and the cessation of hostilities with the return of less exorbitant prices for sulphur and iron.

The process consisted in leaching the spent oxide with hot solvent naphtha. The tar and sulphur were removed in solution and the iron oxide left in regenerated condition on the wood shavings. After drying at temperatures high enough to expel the solvent but not dehydrate the oxide, the material was in as good condition for sulphur absorption as when new. Difficulties developed in the production of pure sulphur, the separation of tar and solvent and the final recovery of solvent for recirculation but it is beyond the scope of this discussion to elaborate upon them.

Summary of Oxide Values

Undoubtedly, the graphical method of comparing the oxide values is most simple to comprehend. Chart No. 1 has been prepared which illustrates the entire ten years' operations at Lowell. This chart also shows the increased length of time for revivification with the former oxides in use and indirectly the decreased labor for handling required. Attention is directed to the fact that only one or two box changes are necessary per year at present, where formerly at least a dozen changes were made.

The recent explosion at Camden, with its accompanying loss of life, should emphasize the necessity of using materials or methods which reduce the always hazardous procedure of opening a box, to a minimum. Even though a plant has ample capacity, the desire to eliminate the need for changes should result in the use of the more active materials.

(Continued in August Issue)

Emergency Utility Rates Must Be Fair

THE Federal District Court for the Southern District of Indiana has reviewed the emergency rate schedules imposed by the Public Service Commission of that state and found that—First, such emergency schedules are proper; but that—Second, the blanket cut of 20 per cent in electric rates for the City of Marion appears too severe. It, therefore, enjoins the immediate enforcement of such order but provides that the company shall file a bond of $100,000 pending a more complete study to insure reimbursement to the consumers if the charges collected prove to be higher than are warranted. The court pointed out that it was preferable to have the rates too high with provision for reimbursement to consumers than too low to be fair, since there was no practical way for providing subsequent reimbursement of the company after rates are once collected on too low a rate schedule.

A New Steel Flooring

THE development of a new steel flooring after long scientific investigation has been announced by Mellon Institute of Industrial Research, Pittsburgh, Pa. This flooring consists of slabs, 24 inches wide and up to 12 feet 5 inches in length at present, that are fabricated by performing two steel sheets and subsequently welding them together in the plane above the neutral axis. A cross-section taken through the width of a completed unit shows four keystone-shaped cells, all connected together near the neutral axis. These four ducts, which constitute each unit, are spaced at six-inch intervals and connect directly, when installed, with the corresponding ducts of the adjacent section of floor slab. This arrangement is described as enabling the utilization of the new floor not only as an efficient load-carrying member, but also as a multiple floor-duct system for handling all types of electrical lines. Such a grouping of parallel cells with six-inch spacing is claimed to permit, at any time, the installation of electrical outlets within a radius of three inches from the exact location required, thus providing permanent electrical flexibility and precluding electrical obsolescence.

It is said that the keystone slab can be installed with ease and rapidity; that it can be bolted, clipped, or welded into place across the structural members, affording a working floor for the various trades. This floor is fire-safe; it is adaptable to appropriate finishes and to suspended ceilings and service piping, and has a low weight per square foot.

Production of Carbon Black in 1931

ACCORDING to the U. S. Bureau of Mines carbon black production during 1931 amounted to 280,907,000 pounds, which represents a decline of 26.1 per cent from the record total of 379,942,000 pounds in 1930. This was the first annual decrease recorded since 1925. The material decline in output in 1931 resulted chiefly from the curtailment of operations made necessary by stocks accumulations from preceding years.

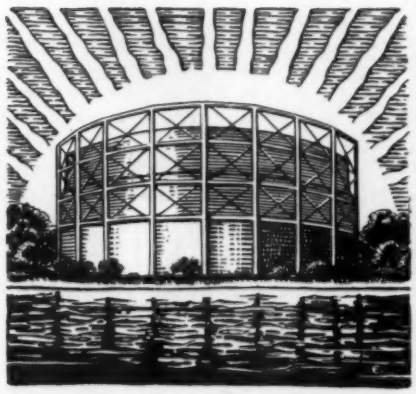
Domestic sales of carbon black in 1931 amounted to 161,712,000 pounds, a small decrease from the 1930 total. Exports showed a gain of 14.8 per cent in 1931 and rose to a new high mark of 96,714,000 pounds. Combined domestic and foreign sales in 1931 totaled 258,426,000 pounds, or nearly 7,000,000 pounds more than in 1930.

Since 1928, the carbon black industry has been centered in the Texas Panhandle. Although the output of plants in the Panhandle area fell off materially in 1931, the decline in most of the other producing areas was even more severe so that the relative importance of the Panhandle area was considerably enhanced. Production in Louisiana, the leading producing State from 1921 to 1928, declined 40.6 per cent in 1931. The output of the other producing States, Montana, Oklahoma, Utah, and Wyoming, increased in 1931, although their combined total was still of minor importance.

The total value of the carbon black produced in 1931 was $8,621,000, or about $6,000,000 less than the value in 1930. The average value per pound in 1931 was 3.07 cents, compared with 3.91 cents in 1930.

The average yield of carbon black in 1930 was 1.44 lbs. per thousand cubic feet of gas. This represents the highest annual yield attained, although it is only .01 lb. above the average for 1930.

Planning Ahead



Wherein is shown that there is a larger field for gas and that by proper planning increased output means considerably lower costs

CHARLES O. PRATT

Consulting Gas Engineer

SCIENTISTS tell us that observations of growing plants show that their growth is via the *push-up and rest* route. That is, they grow for a period, then pause as if to rest and gather the strength necessary to again push ahead or up.

The history of the gas industry seems to indicate the same general plan of growth. During the present business conditions it has apparently reached a resting stage. It should therefore, according to the natural laws, be preparing itself for another period of growth.

Are We Planning Ahead?

Where is this next period of growth going to take the industry and what are the various companies doing in the way of planning for this growth? Are they actively working out plans so as to take their part in the next period of growth?

The manager of a middle west utility looking ahead into the mirror of the future, visualized large opportunities of growth for his company. He believed that gas was the best for heating and wherever heat was used there was a possible gas consumer. Such business could not, however, be had without the proper sales effort and proper gas rates, for there are strong competitors after the same business. The company decided to make a thorough survey of the situation to further determine the possibilities; as a result, the writer was called in to make the survey.

Although the whys and hows of the sales efforts have a very important bearing on the success of securing and holding the business indicated, and must not be overlooked, they will not be discussed here, the purpose of this article being to show that there is a larger field for gas and that by proper planning, increased output means considerably lower costs.

Basis of Proper Rates

Proper gas rates depend on the cost of gas at the consumers' burners. This cost depends on the cost of manufacture, the cost of distribution, and the cost of utilization. An item of cost which is not usually given the consideration due it is that of capital investment. By this it is not meant that gas companies do not get the full value for their money, but that a fuller utilization value of the capital expended would be obtained if it were spent along the lines of a definite plan worked out ahead on a capacity basis.

On the plant in question, there apparently was not much to be gained from cutting plant costs, for it was already using low cost materials efficiently. Cutting plant costs would not cut the fixed charges coming from the plant and the distribution, capital investment, taxes etc. The only way to cut these costs was to increase the sendout of gas. The study was undertaken from this angle and a seemingly absurd figure of five times the present annual output was set as a goal for this survey. Since such a large increase in sendout could not be expected to be obtained in one step, the study was therefore divided into three steps of growth. The various steps were to be based on the most economical and logical steps of increase for the plant capacity.

Naturally the first question to be answered was how, where and by whom was such a large increased quantity of gas to be used.

Disposal of Surplus Gas

The natural gas companies have long sold what they term as dump gas. This is gas sold, usually in large quantities at a greatly reduced rate with the stipulation that the supply can be cut off, or reduced on notice, when the gas is required for domestic consumers. Of late years several artificial gas companies have at times used this means of disposing of their surplus gas. As there are in the district studied a few potential customers for this type of service, it was assumed that this would give an outlet for some surplus gas.

The company has at present but a few house heating customers and it was assumed that with the proper rate this field could be entered quite extensively. It was also assumed that with a lower rate the present customers would increase their consumption somewhat, and that there would be a certain increase in the number of customers served. In addition, there were some additional industrial gas customers, which a recent survey had shown could be sold with lower gas rates.

Due to the consideration of the dump gas outlet it was assumed that the output per month would be uniform. This established the monthly output figure.

The assumption that there would be no dump gas sales during the months of maximum house heating loads determined what, under normal conditions, would be the maximum monthly output. By adjusting the output of the present maximum month for the assumptions made above, that portion of the maximum monthly output being sold for all service other than house heating was determined. From the figure thus obtained for the maximum month house heating load it was possible, with the information available, to compute the annual sales of gas for house heating.

Computing House Heating Customers

From the annual sales it was possible to compute the number of house heating installations that would be required to use that quantity of gas. In doing this an annual consumption of 400,000 cu. ft. of gas per instal-

lation was used. The number of installations thus established indicated that thirteen per cent of the customers being served by the company would have to become users of this service. This percentage did not seem unreasonable; on the contrary, it seemed to be within the realm of possibility when it was considered that Denver in 1930 reported serving ten per cent of its customers with house heating service. (In a recent radio broadcast it was announced that one house in every five in Denver was now heated with gas.)

The maximum monthly sendout as established above was then broken up into its daily outputs. In doing this the house heating load had to be handled separately, for the gas consumed in this service varies with the temperatures of the various days of the month. The balance of the maximum monthly output was broken down in accordance with the relation between the various day's output of the present maximum month to the total of the present maximum month. The peak day output obtained from this breakdown was then divided into its hourly outputs. Here again the house heating load had to be handled separately from the normal lead. This was due to there being no consistent relation between the hour-to-hour consumption of gas for house heating and that for other services. The peak hour for house heating is between eight and nine in the morning, while for this company the peak hour for the present service is eleven to twelve noon. From this division into hourly outputs the maximum demand expected to be placed on the distribution system was obtained.

Having established the various factors which would affect the distribution system, namely, the maximum hourly output and the number of house heating customers, the next step was to apply them to the distribution system.

Outline of Survey

In 1926 the company, with its usual foresight, had caused to be made a complete theoretical survey of the distribution system. This survey had been made using a customer demand of 20 cu. ft. with four demands per hundred feet of main. The report of the survey carried detailed recommendations for the strengthening of the system, as well as master maps giving the size of the mains required on the various streets. There were also included theoretical master maps for the undeveloped territory surrounding the city. All changes and additions to the distribution system since 1926 have been made in accordance with the report recommendations.

The company therefore knew that its distribution system was good for a normal load condition and could take a few house heating loads. However, the addition of a 300 cu. ft. per hour demand for thirteen per cent of all its customers required that the system have some checking. Before any checking could be done it was necessary that the possible locations of these house heating customers be determined.

The company was very fortunate in having detailed maps of the distribution system. Men acquainted with the various districts went over these maps and indicated thereon such customers, to the number required, whom they considered might be possible house heating prospects. With this information and the detail of the 1926 survey, the whole system was studied and the necessary changes for strengthening the system noted. Since the growth in sendout was assumed as taking place in three steps, the changes were listed to correspond as nearly as possible to these three steps of increase. Costs were then set up for each list.

The plant was studied to note the changes that would be necessary to bring it up to the different steps of capacity. In doing this each piece of apparatus was studied to find out just what capacity it was good for and whether or not it could be run at excess capacity and still function properly. Where new equipment was required the situation was studied to be sure that whatever was specified would fit into the final plant and at the same time be of such size that it would function properly when installed. This method was followed so that it would not be necessary to figure on obsoleting equipment installed during the expansion period; so as to have a balanced plant for the third step or final capacity.

The pressure losses through the various lengths of piping in the plant were checked to ascertain the point in the plant growth where it would be most economical to change to the larger sizes that would eventually be required for the final step. A listing of the various changes, together with the additions to the equipment and buildings needed for each step in plant capacity was made and rated as to cost.

Ascertaining Capital Investments

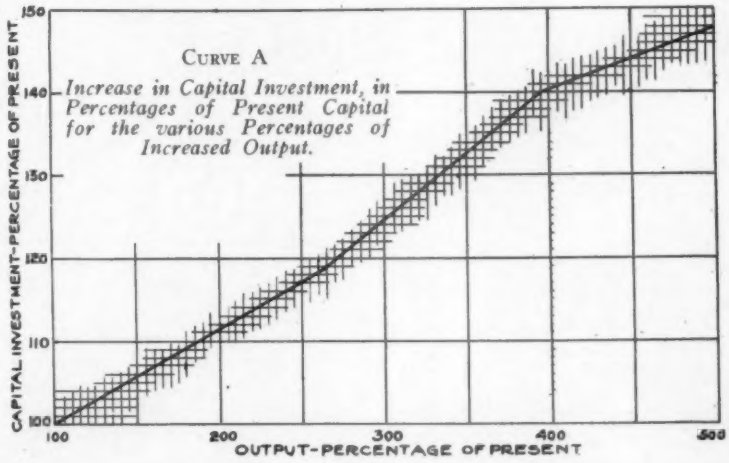
The costs of the distribution and plant changes for each step of increased capacity were added progressively to the present capital investment cost. This gave the total capital investment for each step of growth. These capital investments expressed in terms of percentages of the present capital investment are plotted against the respective sendouts, which are also expressed in percentages of the present, on curve "A". It will be noted that an increase of 165 per cent in sendout calls for only 19 per cent increase in capital and that the final step where the output is five times the present, the capital investment would be increased only 48 per cent.

The cost of gas at the consumers' burners was set up for each step. These costs were computed very much in detail and included all plant, distribution and commercial costs, but did not include such expenses as depreciation, insurance, taxes, capital return or managing expense. The cost per M of gas sold for these latter items would decline with the increased outputs so that the non-inclusion of them does not upset the general downward trend of the cost of gas at the customers' burners. These items were also omitted from the present costs when making comparisons with the costs computed for each step. In addition to the gas costs computed for the three steps of growth as originally outlined, other costs were computed for each step on the basis that no dump gas was sold. This latter consideration would not affect the investment cost set up on curve "A".

Analysis of Curves

These six sets of costs per M have been converted into a percentage relation with the present costs. When plotted against their respective percentages of increased sendouts the curve "B" was obtained. The sharp drop in costs for the first step of growth is due in part to the fact that the plant is not at present operating at full capacity. By comparing points 2, 4, and 5 of curve "B" with points 3, 6, and 7 respectively, the effect of the dump gas on the cost of gas can be readily noted. It amounts to between 6.0 and 6.5 per cent of the present costs. It should also be noted that the reduction in costs between point 1, the present cost, and point 5, the third step without dump gas cost, is 38.8 per cent, while if the third step dump gas is included the reduction is 45.2 per cent. (It must be borne in mind that the dump gas is that quantity of gas necessary to make every monthly output equal to the maximum month.)

The results from which curves "A" and "B" were



CURVE A

Increase in Capital Investment, in Percentages of Present Capital for the various Percentages of Increased Output.

made gave the information desired by the company. However, much investigation work had been done which, if properly recorded, would be of decided value for future reference. A report very much in detail was therefore written. In the report is to be found a detailed listing of the distribution main changes and additions. This included locations for district holders, together with the recommended capacities of the same, the necessary reducing stations for feeding the low pressure system from the high pressure feeders, as well as the additional feeder lines that would be needed.

The detail given of the plant changes included a short discussion, for each step, of each piece of apparatus and what was necessary to be done to have the apparatus handle the increased quantities of gas. If the apparatus was too small, then a short specification of the new apparatus for the service was given. Where preliminary sketches of layouts had been made for the investigation, these were also included. The report also included in tabulated form most of the information used in developing the basic figures of the report, also the detail of the cost figures set up.

As a result of this investigation and detail report the Company now has a plan or guide as to,

1. Where future gas loads can be obtained.
2. A basis on which to set future gas rates so as to obtain this business.
3. A plan for placing the distribution system in proper condition to handle the increased loads.
4. A plan for the expansion of the plant to meet every demand up to five times its present annual output.

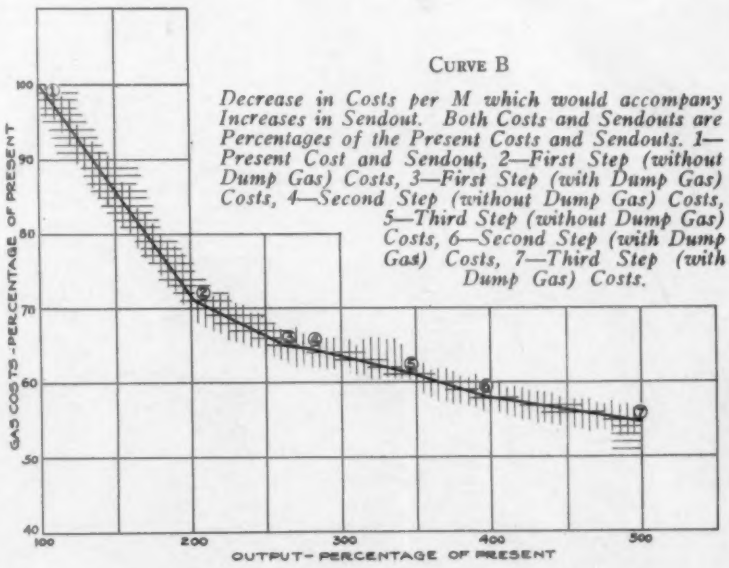
These plans when tempered with such new developments as may come in the various departments of the gas industry, can be used for some years. Following them will hold the capital investment and the obsoleting of equipment to a minimum.

The question may be asked: what if natural gas comes into such a nicely laid out plan of growth; would not this work all be lost?

The market for the sale of gas would remain about the same, whether it be natural or artificial, with the possible exception of the addition of some large industrial users. A completion of the changes recommended for the distribution system would place it in a position to handle as much gas per customer as any natural gas company is today distributing. There, of course, may be isolated cases where some industry would call for a large quantity of gas. Such cases are apt to come up even without the advent of natural gas and must be considered as and when they arise.

The position of the plant, if natural gas comes, would depend on what method of handling the same is decided on.

For every gas company the coming of natural should mean a complete and thorough study as to how it can most economically be handled to meet particular conditions. There are many phases to the adaptation of natural gas to existing company conditions that can be worked out ahead of time, so that when natural gas does come the answer of how to handle it can be readily and speedily obtained. When natural gas gets within striking distance of the district served by the above company there is no doubt but that they will have a survey made on that subject.



CURVE B

Decrease in Costs per M which would accompany Increases in Sendout. Both Costs and Sendouts are Percentages of the Present Costs and Sendouts. 1—Present Cost and Sendout, 2—First Step (without Dump Gas) Costs, 3—First Step (with Dump Gas) Costs, 4—Second Step (without Dump Gas) Costs, 5—Third Step (without Dump Gas) Costs, 6—Second Step (with Dump Gas) Costs, 7—Third Step (with Dump Gas) Costs.

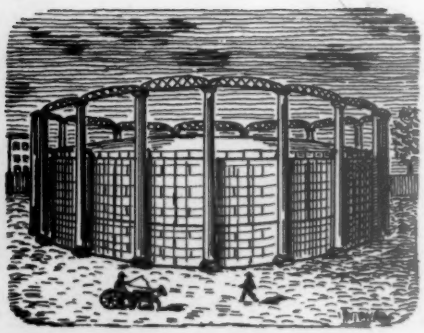
From the above comments it will be seen that the advent of natural gas will not void the work or plans already laid out. In fact just the opposite; they will be of decided advantage if natural gas were to come, for there is a definite plan already worked out for increasing the capacity of the distribution system, and for handling larger quantities of gas at the plant if dilution of the natural gas is to be undertaken. The company can therefore proceed with assurance along the lines of the plans laid out.

This is planning ahead.

Lessons from the Past

HENRY M. RILEY
Editor, American Gas Journal

178 **American Gas Light Journal.** May 2, 1876.



HARD TIMES.

From every quarter the reports of dull times and depression in business continue to be received. To the laboring classes, and to the mechanics, these are not glad tidings; but, nevertheless, the only thing to be done is to make the best of it. Of course the strictest economy is forced upon many, and often the hand that in prosperous times has quietly, and unknown, helped a less fortunate brother, would now be glad to receive even a small recompense for almost any work that it could find to do. Honest labor finds it hard to get employment, while capital lies almost idle waiting for investment. During the past week the government called for bids for about five million of Bonds, and although the terms were such as precluded the offering of any bid for less than half a million dollars, thus excluding all small investors, still the total amount of the bids for these bonds exceeded sixty millions, at prices above par in gold. This would seem to indicate that there is some money left and that every body does not believe that the country is "going to the dogs" for some years to come. What seems to be wanted by capitalists is safe investment, and if confidence can be restored, and the fact established that hard pan has been reached, there will at once spring up an amount of work that will be sufficient for all who are disposed to work for fair compensation. It has become chronic with too many to cry "hard times", and make no effort to relieve them. There must be concession on all sides, and all classes must join in the work of revival. Capital and labor cannot afford to act antagonistically.

While "the laborer is worthy of his hire," there is no reason why that hire should be out of proportion to the prices of every thing else which labor produces. While the cause of the depression may be attributed to over production, inflation, undue speculation, or any other cause, still it is of the utmost importance to look matters squarely in the face, and not sit down repining, but after a careful survey determine what can be best done to start again.

Times like these have their benefits although the blessings may be somewhat disguised. And what are the benefits to the Gas Maker? Decreased consumption must enforce greater economy in manufacture, and while the gas manager has to furnish less gas, he has more time for study and improvement. His works being less occupied he has the very best opportunity for overhauling the unemployed portions, and putting them in such thorough order, that when increased demands do arise, he is in a position to meet them promptly, efficiently, and economically. Where apparatus is worn out, or where it has performed all the duty that can be safely and reasonably expected of it, take it out and replace by new and better if there is such. There is no greater mistake than relying upon "patching along," and "making it do for now," for at the very time when you are crowded, and want every particle of power you have, then will your patchwork fail you. Times like these are very important to a manufacture which knows no rest, but is continuous, for it gives an opportunity of putting everything connected with the plant in such thorough order that, when the time comes, it will be doubly profitable to push things.

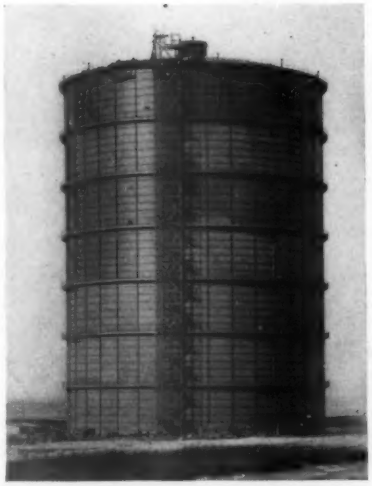
In reorganization and rearrangement of your works, do not rely too much on your own personal experience—see what others are doing and have done—guard against running in a rut—fully consider and mature plans before commencing. The best advice is always the cheapest in the end. Let everything that is done, no matter how small, contribute to the success of the general plan. Here we are met with the objection that receipts are smaller, and yet you advise greater expenditure. Most assuredly. Let any engineer lay before his board of directors a well-matured plan for increasing the efficiency and economy of his manufacture, and they may be easily satisfied that the time when labor and materials are cheapest is the best time to do work.

The depression of the present cannot continue. the increase in consumption *must* return; and, when it does come, the improved methods will soon save the expense of re-construction.

We fear that this may be considered plain talk, but nevertheless we believe it is true—that there is a little too much "rule of thumb" in the gas business. The popular demand for cheaper gas will soon test the efficiency of this rule. A fair trial of methods founded upon careful study and application of the principles involved, together with a knowledge of the best practical results, will soon show their superiority. Thorough system, order, and cleanliness about the works will soon pay a good dividend.

IF one will consult a graph of business activity for the past hundred years he will note a lengthy and serious dip below the normal for the period, 1874-1879. That the gas industry felt the effect of this particular depression is well borne out by the editorial on the opposite page, the same appearing in May 2nd, 1876 issue of American Gas Light Journal.

This date closely approximates the halfway mark between the establishment of the first gas company in Baltimore in 1816 and the present time; but how astoundingly great has been our progress in the second half of this span of existence as compared with the first. Likewise, how stupendous has been the growth of our nation during the past fifty-odd years. Surely, in view of past history, both our country and our gas industry can take heart from the assurance that better times lie not so far ahead.



The old cast iron column, single-lift gas holder has given way to the modern town's "fuel bin."

Let us examine a few facts and statistics touching upon our country and our gas industry during the dark seventies and thereby reaffirm our faith in what the future has to offer. Certainly such an examination should bring to the surface our traditional courage which has carved out the most powerful nation since the dawn of history.

Much has been said along the line of contending that we have become too highly mechanized; yet we find that, at the Centennial Exhibition in Philadelphia, the lightening of man's labor through machinery was a feature of perhaps the highest rank. Thus, the old records tell us that this display of humanity's advancement along the road of progress was opened on May 10th, 1876 when "the President of the United States and the Emperor of Brazil turned on the steam starting the great Corliss engine which put into operation the wheels of 14 acres of machinery at the Centennial Exhibition." Who would venture the cry of "too much mechanization" in the light of Watt's first steam engine, the "great Corliss engine" at the Philadelphia Centennial and the present-day steam turbine. Who would lay our present business predicament to the spineless statement that "we are too highly mechanized" when one considers the wax taper and smoking oil lamp of 1816, gas lighting of the seventies and the electric light and gas househeating furnace of today

We have come a long way in the past sixty years but scarcely further than in the sixty years prior to the seventies, when one takes into consideration that all progress should be of an accelerated nature.

It is of timely interest to note that the House of Representatives in the seventies was lighted by gas at the rate of 5500 cubic feet per hour and not-so-old veterans of the Battle of San Jacinto were paying for their gas at the rate of seven dollars per thousand in San Antonio. Now residents of the latter city are enjoying the ad-

Little did the gas man of the Seventies dream of the present-day monster gas fired industrial installations. Gas fired bake oven in a modern bakery.

vantages of natural gas at an average price of seventy-five cents per thousand.

In 1876, although no reliable data are available, it is likely that the entire gas consumption of the country did not much exceed one per cent of the present output. Further, during the seventies natural gas was having an extremely sparse use; quoting from an issue of American Gas Light Journal of this period we find that "there are many questions still doubtful regarding the use of natural gas in Pittsburgh. One point is certain, that the well that is now utilized has not answered the expectations of those who laid the pipe line." Contrast this situation with the many long pipe lines carrying natural gas to Memphis, Chicago, and other large communities.

Education, the basis for the growth of our country, presents some startling figures. In 1876 the school attendance was slightly under the nine million mark. Today we find 34 millions in our schools. In this period our population has grown from about forty-six millions of inhabitants to about one hundred and twenty-three millions. And it is from the ranks of the present-day scholar that the gas industry as well as others will draw its sinews to conquer the problems of the future. No country will indefinitely sound the depths of business adversity that counts such amazing advancements in education.

Although in 1876 the barbs of skepticism were being hurled at the water gas process it is not without the bounds of possibility that at any time in the near future an entirely new gas making process will flame meteor-like across our horizon and usher us into new fields of bettering mankind's living conditions.

The past teaches us many lessons, the chief of which should be that we will emerge triumphant from the present depths and push sanely but ever closer to fortunately unattainable perfection.

The Tenth Man

LABOR leaders and government officials tell us that at least one man out of every ten is out of work. All over the country relief agencies of various kinds are trying to provide means to take care of this unemployed tenth man and his family.

Suppose one man out of every ten is unemployed; that means that nine out of every ten are employed and have some earning power and possibly some purchasing power. While we are thinking so hard about the one man who is unemployed, let's remember the nine who are at work. The nine workers are now attempting to take care of the one unemployed by contributions and through various relief agencies. While in most instances the unemployed one is obtaining the necessaries of life, he is still idle. It seems to me the way to solve the unemployment problem is to put this tenth man to work if some way can be found to do it. I do not mean so-called "made work" or odd job work, but real, honest labor in the production of goods.

It is my observation and experience that these depressions are ended from the bottom and not from the top. Passing of new laws or making credit easy doesn't completely solve the problem. If this Company had ten million dollars in cash it could pay off that amount of bonds but by so doing it would not put one single man to work. Money is timid; it seeks to hide at the first sign of trouble. Idle money is the most useless thing on earth. All of it piled together couldn't produce a loaf of bread, a pair of shoes or a bushel of wheat. Money hid in the safety vault, buried in the back yard and hid away, is useless. It is only when money is put to work that it is of value to the owner and to the community. There is plenty of idle money in the country but it will not go to work until it is sure that it can do so safely. There is no use in starting up a mill or factory until there is a certainty of disposing of the manufactured goods. So long as the mill or factory is idle the tenth man will be idle and the nine who are working will have to support him.

There are 2700 of us working in the Lone Star System group. Perhaps most of us have fixed charges in some form. Some of us owe the banks; some bought radios, automobiles and other things on time payments; some bought homes and are paying for them. Most of us assumed these fixed charges out of our margin of earnings over and above actual living expenses when times were good in 1929. Notwithstanding that all of us had our wages and salaries adjusted downward, I am satisfied that most of us have a larger margin over and above fixed charges and actual living expenses than we had in 1929 on account of the greater decreased cost of living.

This being so, what are we doing with it? Most of us have been buying nothing we could get along without. All of us have been using up the things we bought before. This is true all over the country. Automobiles, household furniture, shoes, clothing, are wearing out, being consumed by use and not being replaced to any great extent. That is why the tenth man is idle and is being supported by charity.

I think it is time you and I should begin buying the things we need and can afford to buy. I don't mean buy recklessly. Budget the things you need and if you have the cash to spare for them go ahead and spend it. The thing that is holding most of us back is fear; the fear of losing our job or of some catastrophe. Fear is a form of cowardice. If we fear a thing we admit to ourselves that we are not big enough to overcome it. Let's remember that Lone Star Gas System is going to continue in business, that it is going to require men and women to operate it and fulfill its service function and that if we attend to our jobs right the odds are that we will keep them.

I firmly believe that in no other way will we lay a solid foundation upon which will be built the next period of prosperity. If every one of the nine workers were to spend five cents a day for each member of his family in the purchase of new goods actually needed for consumption we would let loose a wave of buying power in this country that would soon solve the entire charity problem so that there would be no tenth man to take care of. I think you and I have an obligation and a duty to do our share. Let's renew our faith in ourselves and in our institution; let's strengthen our courage and drive fear from our hearts. If we do this it will not be very long until our economic problems will be on the way to a successful solution and we will again have entered upon an era of great prosperity.

—Portion of an open letter sent by L. B. Denning, President, to employees of Lone Star Gas Corp.

A Complete Program is Needed for Successful Promotion and

Selling of Gas

R. S. McBRIDE
Consulting Editor, American Gas Journal

MERCHANDISING is now more important than manufacturing. This is a somewhat new situation in the gas business. And the realization of the correctness and importance of this fact has not yet been adequately attained.

Merchandising includes more than mere selling. It includes a corollary and equally important activity—Promotion. Promotion is an entirely different activity than sales. And yet promotion work must be planned and carried out closely to coordinate with and to support sales effort. The activity itself is, however, not only different in type; it is also different in its psychology, and may at times seem even somewhat different in its objective.

The major objective of a promotion program is the building up of an appreciation on the part of the potential users of a device or commodity of the availability, the merits, and the potential usefulness to them of these goods. Promotion programs will in themselves not bring sales. They merely create opportunity for sales. The selling effort, whether it be by letter, by personal solicitation, or otherwise, must follow and independently secure the orders. Promotion programs, even the most effective, will within themselves afford only a small percentage of the signatures on the dotted line, which are the essential objectives of selling. Promotion does, however, greatly reduce the cost and the difficulty of sales.

A COMPLETE program of promotion includes many types of activity. Advertising in its various forms is one of these; but advertising improperly based or inadequately supported by the other parts of a complete project cannot accomplish its full purpose and hence inevitably becomes more costly and less effective than it should be.

Any complete program will start first with a comprehensive and thorough factual study. Such an inquiry, often referred to as commercial research or market research, is an essential prerequisite to efficient spending on other types of activity. It is necessary to a selection of the markets to be cultivated and of the types of men to be interested; it determines what will probably be the most effective distribution of funds between different types of publicity material; it affords a basis for selection of advertising mediums; and it furnishes factual matter to be used in advertising, in editorial publicity, and in all of the public relations activities that ensue.

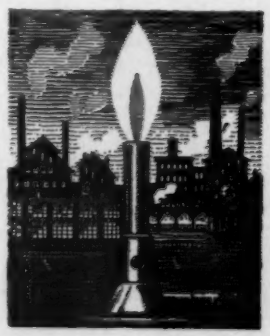
ORGANIZING a promotion program is a job for the general executives, assisted by department heads engaged in research, development, manufacture, and sales. Oftentimes the largest task of all, at least at the start, is in securing a close coordination between the functions of the several departments. Research men will be engaged on projects having no early applicability; salesmen will be making premature announcements or claims impossible of performance; or the works will find itself constantly embarrassed by interrupted and modified production programs that should by proper cooperation have been made smooth running and more efficient.

In general, it is essential to have a promotion committee, working as an *advisory* agency under the promotion manager, as a means for exchanging experience between the several departments affected by promotion work. It makes little difference what the titles of the men may be; it is essential that someone equivalent to research director, chief engineer, general manager of operation, and sales manager sit on this committee.

The same general organization is essential whether the promotion work is to be done by a single company, by a group of affiliated enterprises, or by an industry as a whole. In the gas business it would be essential that all of the points of view named be represented whether the campaign be one by water heater manufacturers or by the small local enterprise in some community of only 25,000 population. In the smaller places it may be that one man will have to represent several points of view. But unless he consciously and deliberately represents all of these there may later prove to be important missing steps in the logical sequence from the initiation of the program to its successful fruition. In fact omission of such steps is likely to result in a decreased effectiveness on the part of the entire program.

FOUR TYPES of activities usually make up a complete promotion program. Information must be gathered; publicity material should be prepared; advertising is planned and carried out; and outside cooperation must be maintained.

In the promotion of gas sales the information required deals not only with the application of this fuel but also with the competing sources of energy supply. Everything bearing on the utilization of gas and its competitors becomes pertinent. Furthermore, it is important to know how large is each prospective market and the load characteristics created thereby. Only when a thoroughly studied situation is before the executive can he determine how to distribute his funds properly in the subsequent promotion work. Furthermore, only with full facts available is it possible to determine which market is most desirable to the company in order that the efforts of the promotion and the sales forces be concentrated on the type of customer most desired.



Advertising, the second part of the promotion effort, is a many-fold activity. It may in some circumstances include only the purchase and use of space in newspapers and periodicals. Usually, however, it must be extended to provide literature for the corporation to distribute to dealers and to those classes of prospective customers whose trade is being sought. In some larger companies advertising includes the preparation and issue periodically of a house organ, and this may be for distribution either within the company or for distribution to certain classes of outsiders. The company program may include the making of motion pictures or even the taking of time on the radio.

The objective of all of this advertising is, of course, to attract attention and to furnish information to present to prospective users of the company's products in order that they may more easily be "sold." It should be understood that the advertising in itself is not selling. It merely facilitates this latter activity.

EDITORIAL publicity, sometimes wrongly called free advertising, is an essential, but often neglected, part of promotion work. It is accomplished by the furnishing of worth while material for the use of others, including editors of magazines and newspapers, lecturers, book authors, or others who in turn become the agents of further dissemination. In former times the furnishing of such editorial publicity involving very objectionable practices was carried on by some. But today editorial publicity on behalf of any material or service is an ethical and welcomed part of the promotion campaign. Properly planned, it assists honestly and constructively the readers of the periodicals or the others reached by this indirect channel.

Editors of newspapers and magazines receiving such material which has real value for their readers are glad to use it; and this use does not in any way hinge upon the question of whether the person furnishing the information is an advertiser or not. In other words, the sole test which the wise editor applies to such material is that of value and interest for his readers. If the material has in itself merit, it will be printed. If it lacks merit it should not appear in the columns of the paper even though it comes from one of the principal advertisers. Of course, this ideal is not always fully observed, but it is far more widely practiced than most people realize.

Public utility companies have been very clever users of that type of promotion work which involves outside cooperation. In striking contrast with most manufacturing industries, the gas men of the country have been good cooperators. They have planned their public relations work closely to serve the real interests of civic and trade groups in their home community and those trade associations working upon a national scale. Had the work been carelessly executed or poorly planned, it would have been a "boomerang." Under wise management this part of promotion work has usually been altogether constructive and helpful both to the industry and to the public which it serves.

BUDGETING of a promotion program is just as feasible as budgeting of manufacturing operations. All that is necessary in order to formulate a budget is a reasonable estimate of the amount of activity expected in each of the several types of promotion work and a fair knowledge of the unit costs of carrying out each activity. Some of the major items which usually enter into such budgets are:

Gathering of information
Market research
Editorial publicity service
Advertising in periodicals
Preparing and distributing corporation literature
Issue of a house organ
Motion picture distribution
Radio or other specialized advertising
Customer cooperation
Customer research
Educational cooperation
Association and committee work
General or management expense

Each program is a problem in itself. The extent to which each type of work enters depends on the commodity or device to be sold, on the types of markets ultimately to be reached, and to a very considerable degree on the size of the budget which it is practicable for a company or industry to finance. Obviously, certain types of promotion work should not be undertaken at all unless the funds available are adequate for a substantial effort.

Budgets for national promotion work, as for example promotion of household cooking equipment, are quite different than budgets for a local company effort. The national program necessarily includes much more in the way of technical study and must be preceded, in order to be fully effective, by a more thorough inquiry as to what is actually the situation affecting the backers of the program. Oftentimes an extremely small expenditure for several months at the beginning of the program proves to be a great economy in order that the plans when formulated will harmonize with the real needs of the industry.

A local project, as for example intensive promotion of water heaters in a single community, is generally a short-time undertaking. Of course, advance preparation, so that all parts of the effort are properly coordinated, is essential. But the interval devoted merely to gathering of information is usually much shorter.

IN EVERY COMPANY, whatever its size, there should be someone who has as one of his duties the task of gathering information essential to sound and continuing promotion work. Ofttimes this gathering of information is most easily accomplished simply by having an extra carbon copy of all letters bearing on any phase of promotion work go into a general subject file. The creation of such a subject file then is merely an incidental part of the duties of the chairman of the promotion committee and his clerical assistants. Such a scheme insures that when any new topic must be given attention there will be conveniently gathered together in one place all of the material bearing on this subject that has previously resulted from other activities of the company. Even subjects thought not to be of any interest to the company at the present time can well find a place in the filing system as later conditions often necessitate study of most unexpected subjects. The cost for such effort is a negligible item in contrast with the later benefit when that unexpected subject becomes important and timely.

The matter of cooperation of all different companies interested, and of all different officers of the single company, in maintaining its steady flow of pertinent information into the information file is important. Every

case which is analyzed with a prospective customer is likely to afford some data that may later be vital to another project. Each individual salesman, and even the higher executives in their personal conferences, should make a memorandum of precisely what transpires in such cases as a guide to later action not only of their own office but of other divisions of the enterprise with which they are connected.

It must be recognized that this "writing of reports" is always something of a burdensome and tedious part of the employees' work. They should, therefore, be encouraged to do a good job by having clearly presented to them the long-time benefits which they personally, and their company or their industry, will gain from the effort. They should be given to understand that it is not a desire to police their activities, but the necessity of planning future effort, which makes these reports important.

And the person who organizes the files of this material must be very sure that all material is properly systematized. Merely a bulky collection of uncoordinated or ill-assorted facts is not helpful. An information file becomes valuable only to the extent that it is properly classified to bring like material together either by placing it in a single section or by appropriate cross reference. This systematizing must be a current and regular part of the work. It is not safe to allow such material to pile up for weeks or months at a time until some "spare time" will afford opportunity for sorting and classifying. The cost of the work if done currently is negligible, but the cost becomes prohibitive if it is made a special task only at relatively long intervals.

EDITORIAL PUBLICITY furnished by local gas companies for newspaper use may be of several types. Actual news of the company's activities is, of course, always welcomed by the local press. And many matters that are mere office gossip become real news of wider interest when attractively summarized. In a local company it is usually necessary to assign the preparation of material of this sort to someone who has what reporters call a "nose for news." Such persons are often thought by their superiors to be merely idly gossiping when they are found passing about among their fellow workers little newsy bits about office activities. Some executives have a mistaken idea that suppressing this chatter is essential to good discipline. Of course, there are some malicious-minded individuals who unconscientiously do prove disturbing elements by distributing this kind of information. But more often than not their activities can be diverted into constructive promotion by wise leadership and advice.

Of course, it is not suggested that these individuals should independently be allowed to give out their prattle to every newspaper man who might call. That would inevitably result in undesirable consequences and embarrassment. But if they can be guided into use of this news sense for the benefit of the company, the gain to all will be considerable. Sometimes it is possible to offer a small prize to the individual in the company who can furnish in any week the most interesting news item for use with the outside papers. Other companies use a great deal of the material which is office gossip simply for the company house organ, thereby stimulating materially the *esprit de corps* and the solidity of company effort.

When such material is brought together in some promotion office there should be available there a person who may be interviewed by the local newspaper reporters. And it is a great mistake to have this man one of the type who is so discreet that he never says anything. Discretion is essential, but discretion in giving out plenty of information and in frankness with the reporters is just as important as discretion in suppression of unwanted publicity. Only a few newspapers are so operated that their reporters are unable to observe fully the confidences of company executives in matters of either corporate or public concern. Frankness even in matters of some embarrassment to the company pays, and pays well. The vast majority of the public will be sympathetically and reasonably disposed toward the company that has made a mistake if they do not feel that the company is trying to deceive them as to its problems. It deflates the balloon of the "scare-head" news writer when all the facts are available, and especially he knows that the true situation will appear in contemporary papers whether it appears in his own or not.

NATIONAL CAMPAIGNS for the benefit of some particular division of our industry demand that a definite part of the budget be set aside for the preparation of technical material to be used by the appropriate magazines or newspaper syndicates that should be interested. In a large campaign it is generally desirable to have one man of real editorial experience devoting almost his entire time to the preparation of editorial matter for this use. Such a representative, for example in the gas range campaign now being undertaken by builders of such equipment, will be able to place a great deal of valuable material in the magazine pages reaching the housewife and the men home-owners. Such material will be welcomed by editors if it is presented in a straight-forward, ethical fashion even though they do not expect that the advertising campaign which is planned is going to furnish money to purchase space in their own periodicals. They will get their benefit from the use of this material through the fact that it affords value and interest to their readers commensurate with the space which it occupies in their pages.

The cost of such work is largely the salary of the man engaged in doing it. But the budget should also include an appropriate sum for the necessary travel to secure the needed information and for conference with editors and with others interested in the projects under way. Such an editor, together with travel and clerical assistance, will usually cost initially from $5,000 to $6,000 per year, neglecting any charges for overhead. But when a man who is engaged in such work demonstrates real capacity for his job, it becomes important, here as in all other lines of human activity, to give him the fullest practical encouragement by increased compensation commensurate with the service which he is rendering.

ADVERTISING takes many forms. Its function is so much better understood than other parts of promotion work that it is not necessary to discuss it at this point. It is important, however, to emphasize that advertising must be planned to suit the audience addressed. "Shot gun" methods no longer are effective. Each piece of "copy" must be specifically prepared for the particular magazine or group of magazines in which it is to be used. Any other scheme reduces the effectiveness of the effort far more than in proportion to the saving involved. In fact some companies find that for every two or three dollars which they spend in buying space, it is necessary to spend one dollar in preparing the copy to put there. Of course, this ratio varies according to the type of material and the number of maga-

zines or newspapers to use the copy. The important fact which is absolutely universal in its application is that copy to be effective must be suited to its audience.

Timing of advertising to coordinate with selling effort is also important. Furthermore, it should be timed to coordinate with those follow-ups which should be given to replies from the "ad." Some people make the mistake of rushing into one part of the promotion program before they are really ready for the entire coordinated effort. The results are, of course, waste and relative ineffectiveness. Coordination of all parts is just as important as cooperation of all parties.

The gas industry stands at the threshold of a new promotion era. The enthusiasm and support of new programs which has been evidenced by the generous subscription to advertising programs speaks well for the future. It is certainly to be hoped that each part of these new undertakings can be carefully prepared, effectively coordinated with the others, and efficiently managed with enthusiastic cooperation of all parts of the industry.

A New Theory of Lubrication

AS AN outcome of the work of the Lubrication Engineering Committee of the American Society of Mechanical Engineers, a new and startling theory of the Mechanism of Lubrication has been developed and was presented to an Informal Conference at the Engineering Society Building on June first, under the auspices of the A.S.M.E.

The practical importance of this theory lies in the fact that it proposed novel bases for the evaluation of the lubricating properties of oils and greases and, incidentally offers an explanation for a number of matters that have been puzzling lubrication engineers in the past.

The development of this theory has been made possible by discoveries of new features in the behavior of lubricants which in turn have been made possible through tests made on a new machine for investigating phenomena of lubrication erected by the Sperry Gyroscope Co.

The new theory of lubrication offers factual support for the discoveries of German investigators, such as Viewig, to the effect that lubricating properties of oil as such are not determined by the viscosity of the oil.

It also offers experimental proof of the correctness of Langmuir's theory under which a layer of lubricant one molecule thick is held by chemical forces at the face of the metal, as well as the theory of French investigators supported by Sir J. J. Thompson, the famous British physicist, to the effect that a comparatively heavy layer of oil is held to the face of the metal by electrical or magnetic fields.

Layer Characteristics of Lubricant

With the new machine, not only has the actual presence of these layers been confirmed but the lubricant has been found to peel off layer after layer. It has been further discovered that we finally reach an "ultimate" layer which does not peel off, even when enormous disruptive forces have been applied to it.

Another startling discovery has been that if the ultimate layer is wiped off the face of the metal a new layer of lubricant is immediately created thereon and, for example, in the case of a steel lubricated surface, as many as 21 layers of oil have been wiped off where the presence of even a single fluid layer has never been suspected before.

With these and certain other facts as a foundation, a new picture of the mechanism of lubrication has been built up. Briefly, according to this theory a layer of oil is formed on the surface of the metal, the thickness and strength characteristics of this layer being determined by the character of the lubricant, and the character of the metal. This layer, in turn, pumps up under an enormous pressure of oil into the crevices of the metal. (This is in accord with the most modern conceptions of phenomena of adsorption). In the course of contact with the bearing surfaces on the journal and the brasses (the same especially applies to ball and roller bearings as well as Kingsbury bearings), the free film plays no part as a means of separating the surfaces of the metal. This is done by the newly discovered powerful adhering layers of lubricant and when, in the course of operation of the bearing, these are wiped off, they are immediately restored by the oil ejected under enormous pressure from the crevices in and under the metal surfaces. The remarkable circumstance is therefore established that any lubrication is essentially high pressure lubrication.

Two-Part Aspect of Lubricants

In the above mechanism of lubrication entirely new functions are ascribed to the free film of lubricant. Incidentally, tests on the new machine have given a basis for serious intimation that lubricants (many if not all) consist of two parts: one performing the functions of the lubricant and the other acting as a colloidal solvent thereto. The present apparatus for measuring viscosity gives figures which apply to the two constituents of the lubricants jointly and none of the existing methods measures the viscosity of the constituents singly. If viscosity has any bearing on the lubricating properties of the oil, it is only the viscosity of the lubricating constituents of the lubricant and not the diluent constituent. Because of this, all present attempts to tie up the viscosity of lubricants with their lubricity are placed under suspicion and will remain so until the "true" viscosity of the lubricants is determined.

A closer knowledge of the mechanism of lubrication is imperatively necessary today. First, because with the speeds and loads used in our present machinery, the difficulty of the problem of lubrication has increased tremendously as compared with even the recent past. We have reached the stage where in order to handle the lubricating problems we have to have a precise knowledge of the behavior of metals towards lubricants and lubricants towards metals. We can no more be satisfied with guesses and assumptions. In the next place, so many lubricants are offered to engineers nowadays and so great is the responsibility of the engineer who is to make selection from among this mass that rapid and reliable methods of testing become exceptionally important and, of course, no testing can be accomplished in a satisfactory manner unless we can place a definite and proper value on the various factors, and that means, unless we have in our minds a clear picture of the mechanism of lubrication. The paper has been prepared for the Lubrication Engineering Committee by William F. Parish, Chairman of the Committee, formerly Chief of the Lubrication Department of the Air Service, War Department, and Leon Cammen, Consulting Engineer.

The Unity of Utilization and Rate Making

F. W. SATCHWILL

Gas Sales Manager, Winnipeg Electric Company,
Winnipeg, Manitoba

THE gas sales fraternity have been rather guilty of evading economical realities. They have placed too much reliance upon a sloganized patter regarding "intangible values." To every well-informed person who buys a commodity or service upon its merits there is no value which is intangible. If it cannot be calculated in dollars or cents it is not a value. Careful application of this statement to any purchasing problem you may have will prove its truth. Much of our talk of "intangible values" was correct, except that those values were not intangible at all. Cleanliness, flexibility or instant heat are worth money to an extent that can be measured in the cost of a given process in a given plant.

Nullification of "Intangibles"

There was a time when gas possessed enough of these mis-nominated "intangibles" to justify its selection for numerous applications at the price for which it was sold. While most of us have continued to talk "intangible values," many of these real advantages have been nullified in certain fields by the swift improvements in the utilization of old competitors and the introduction of new ones, such as butane. Gas is still pre-eminent for many purposes, but the field is fast decreasing, both geographically and otherwise.

A fuel can defeat competition only where its value is greater than that of any competitor. Its value may be found by jointly comparing its utility and price with those of other fuels conceivably applicable to the operation. The net B.t.u. cost of the successful fuel will be lowest, or it will have other compensating advantages. In short, it will give the customer a lower cost or a better quality product, whether it be a galvanized bolt or a heated house.

Increasing competition, which is a characteristic of our industrial and commercial system, compels fuel users to search continuously for present value at a lower price. This incentive has inspired the forces in and allied to the oil, electric and coal industries to develop appliances and utilization to a point where joint consideration of price and utility is proving many of our cherished "intangibles" to be intangible indeed. In the baking industry, for instance, gas is hard pressed to hold its own against the latest development in indirect-fired oil ovens incorporating external unit heaters. They exhibit flexibility, cleanliness and reliability to a degree previously believed to be possible only with gas. Electricity is also gathering support in this field, while pulverized coal is a newcomer with possibilities. For soft-metal melting, particularly in newspaper stereotype furnaces, electricity is making its presence felt. Our best plan here may be to improve gas utilization for this purpose by selling the Kemp Immersion System of firing. These are but instances of the increasing competition made possible, not by any temporary depression, but by scientific evolution. It is sure to continue.

Here, then, is a vital and immediate problem for the engineer and the statistician. First, we must try to improve our utilization. If that cannot be done sufficiently we must examine costs from mine and oil well to the meter in an attempt to make economic rate reductions. If neither of these efforts meets with success, there is still one thing possible. We must develop another process for the production of gaseous fuel which will enable us to sell heat at lower prices than we can do with present methods. We cannot all obtain natural gas. This new process will have to yield a fuel of similar physical and chemical characteristics to our present gases, that existing distribution systems and appliances may carry and burn it without undue change. I have a confident belief that the manufactured gas industry will develop or find such a process. This is an age of wonders and the reward will be great.

An Inherent Weakness

One important reason why a new process is desirable, even if not an immediate necessity, is that the coke-oven process has an inherent commercial weakness. It produces two competing fuels. The price of oven gas is largely determined by the coke revenue. Any considerable expansion of gas into househeating, industrial steam and other fields where coke is now widely used might cause a difficult situation. A process enabling us to sell gas at competitive prices and yielding saleable by-products that are not fuels would be of inestimable value.

In different cities the forces of competition will continue to press upon us in various forms. Oil may be the trouble-maker in one place; electricity in another; butane in the next, and so on. For this reason the efficiencies and rates needed to secure gas loads will not be the same everywhere. But they are everywhere the two factors which certainly need immediate improvement. In Winnipeg, we have estimated the requirements. We are now endeavoring to meet them, remembering that "intangible values" must belie their name.

The local packing-plant and sausage-smoking business attracted our attention, but we found that with existing gas equipment our rates were too high. Experimentation produced apparatus and methods of installation which improved efficiency and performance sufficiently to permit the use of gas without rate reduction. We have now obtained considerable smoking and hog-singeing loads and expect to get still more. Our galvanizing load at a local plant was seriously threatened by oil. The combined effect of new industrial rates and the development of a radically new furnace design has now warded off competition and has enabled us to persuade the customer to instal an additional gas furnace for this work. In the water-heating field, however, needing the business and being un-

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able as yet to improve upon the efficiency of the best heaters now available, competition has forced us to reduce our rate.

In the first of the three foregoing examples, improved utilization was sufficient. The second required a joint effort by engineer and ratemaker. The third had to be solved by the ratemaker alone. These cases have been given at the end of this paper to place final emphasis upon the necessity of realizing that the highest economic rates for the increasing sale of gas can be determined only by recognizing the unity of utilization and ratemaking.

A Large Untapped Sales Field For Gas House-Heating

O. J. KUENHOLD
Gas Appliance Engineer

IT HAS been said that one can know the future by studying the past. The application of this philosophy to gas house-heating brings some very interesting conclusions—in fact it points out coming developments very clearly.

The heating of homes with gas started in a rather narrow restricted path and gradually broadened out into wider channels; a process which is still continuing. Only a few years ago gas house-heating sales work was concentrated largely upon central gas designed heaters —first gas boilers, then gas furnaces. The prevailing idea was that it would be suicidal to sell anything but central gas designed heaters. There seemed to be an idea that the old coal furnace or boiler had to be completely eliminated and the owner placed in such a position that he had to depend entirely upon gas for heat.

Later on cases developed where, either because there was no basement or because the owner refused to go to the expense of a centrally fired heating plant, the only chance of making a sale was to equip his home with room heaters of the circulating type or with gas-steam radiators. This gave gas house-heating a second sales channel.

Trend to Conversion Burners

In the meantime the oil burner industry was selling thousands of oil burners for converting coal furnaces and boilers into oil heating units. There were no oil-designed furnaces and boilers. Oil burners were all conversion burners. The gas industry, which had for years condemned conversion gas burners as a menace to gas house-heating rather suddenly became aware that conversion burners could be sold to numerous homes which would not consider discarding their existing coal furnaces or boilers. Conversion burners were then accorded a place in house-heating sales work with considerable doubt and suspicion, but the public accepted conversion burners avidly and their employment by gas companies as a third sales channel for gas house-heating spread so rapidly that within a period of only two or three years it won an important place in the extension of house-heating with gas.

The point to be particularly noted is that, in accepting conversion burners, the gas industry yielded to a latent public demand. It fitted the ideas of many home owners who could not bring themselves to discard their central coal fired units and were willing to chance higher gas bills if the installation cost was less. And so the broadening of the ideas of gas companies led to a broadened sales field for gas house-heating. By so increasing the sales channels the number of possible sales closures were practically doubled.

Today no sales set-up for gas house-heating is complete without the three lines—central gas fired furnaces and boilers, room heaters, and conversion burners. Each of these three classes has a distinct place in the program and distinct advantages, either from the gas heating engineer's viewpoint or from the customers' viewpoint. But these three classes do not yet fit all purses and requirements. There is still a fourth sales channel —a fourth class of purchasers to reach.

A Latent Demand

Central heaters and conversion burners are purchased to any extent only by those with good healthy bank accounts and incomes. The big middle class mass market is as yet untouched. In this class there is a latent demand for something demanding an initial outlay which is not excessive and monthly gas bills which fit the average, more restricted pocket book. Tap that immense field and gas companies will find volume business exactly as the Ford and Chevrolet automobiles have found.

This fourth field is part-season gas heating with auxiliary gas designed furnaces and boilers. The auxiliary heater, especially designed for the purpose, is installed adjacent to the coal furnace or boiler and so interconnected that either one or both may be fired. The same pipes and ducts are employed—in fact the existing coal heating system is not disturbed except for making the necessary cross connections. The installation is quite simple and not expensive.

The design of the auxiliary furnace or boiler is similar to a high grade, highly efficient central gas fired unit except that certain precautions are necessary to insure good air, steam or water circulation and that the draft of the coal furnace is not killed. Description of these design modifications are outside of the scope of this article.

Such auxiliary installations are not new by any means as they have been very successfully employed for years in certain natural gas territories and the "bugs" have been worked out. They give perfect owner satisfaction. Usually the capacity of the auxiliary heater which is selected for a given home is such that it is able to supply one-half of the maximum heating capacity required in coldest weather. That is, the unit is capable of supply-

ing about 40 degrees of heating or, in other words, it will be able to heat the home to 70 when the outdoor temperature is 30 degrees or higher. This enables the auxiliary heater to supply all needed heat during about 70 to 75 per cent of the heating period, leaving only periods of from a few days to a very few weeks when the coal furnace or boiler must be resorted to.

The above coldly stated facts mean very little until we analyze exactly what they mean to the home owner. So, let us consider the auxiliary warm air gas furnace from now on so that we shall have something specific in mind, while we consider exactly how the auxiliary furnace fits the ideas and purse of Mr. Average Home-Owner.

In the first place, he gets what he must have—means for employing gas for heating with highest efficiency so that he secures the very maximum of heat and comfort for minimum gas bills. Second, the installation cost is kept down to an initial investment which he can afford. He retains his coal furnace and need not be persuaded to discard the investment it represents. Sales resistance is thus broken down, so that volume sales are obtainable.

Next, consider the operating advantages.

Coal furnaces operate at their lowest efficiency when running in checked position, as they must in mild weather. The combustion chamber temperature is too low to consume all gases and coal. At the same time the room temperature is difficult to control and the furnace requires an amount of attention and nursing which is all out of proportion to the amount of heat required. During the day, in fall and spring for instance, the coal fire may be maintained when no heat is required to avoid the fuss and labor of building a new fire in the evening. All this means waste of coal and excessive time, labor and dirt.

Contrast this with an auxiliary gas furnace:—The owner simply lights the burner, turns it up as high as needed and turns it off when no longer needed. If thermostatic control is sold along with the auxiliary furnace the owner simply lights the safety pilot and has no heating cares whatever.

Because of the inefficiency of coal furnaces in mild weather and the high efficiency of the gas designed auxiliary furnace, its operating expense compares very well with that of the coal furnace in mild weather. Gas heat shows up at its very best. The gas bills are in fact entirely within the control of the owner for when colder and colder weather sets in, if he finds his gas bills climbing higher than his monthly income can stand, he can revert to his coal furnace.

Whetting the Heating Appetite

However, this is where human nature comes into play. Once the average home owner starts his auxiliary furnace in early fall and experiences the comfort of gas heat without effort or bother on his part, naturally he will delay going back to coal as long as he can. He may try it and after a day or two of running up and down stairs, shovelling coal and ashes, he will let the coal fire go out and again light the gas auxiliary. He will, in most cases, go back to the bother and dirt of coal only when he has to, and will be only too glad to go back to gas as soon as severe winter weather moderates. Even in severe weather the auxiliary furnace is always ready to help bring up the room temperature when the coal fire has died or almost died, or to help a coal furnace which is too small for the job.

In the meantime the owner gradually becomes converted to the comforts, convenience and cleanliness of gas heat by the most powerful and effective means in existence—actual experience and contrast between the old and the modern. The way is then paved for the next step—to sell the owner on all-season, all-gas heating.

One type of auxiliary furnace upon the market is so made that, when the owner is ready to go to all-gas heating, the coal furnace is removed and a second section is added to the auxiliary furnace. This converts it into a regular gas designed central heating furnace. The owner is thus brought into all-gas heating by two steps where it would in most cases have been impossible to convert him in any other way.

Every time an auxiliary furnace is sold it may therefore be regarded by the sales department as half of a complete sale. The purchaser's name should at once be put down as a live prospect for the sale of the missing half of the furnace and in a large number of cases it is only a matter of a season or two when the final sale is consummated.

Proportionate Sales Prospects

The volume possibilities for auxiliary heater sales deserve serious attention. A bird's-eye view of any gas company's territory will reveal about the following proportionate sales prospects:—100 home owners whose pocket books might stand the installation of a central gas heater, and perhaps another hundred home owners who might be convinced that their income could stand the installation of a conversion burner and all-season gas heating. But besides these, there is a huge mass market where the incomes are closer to the average income. This mass market cannot be reached with any all-gas heating appliances. There are thousands of homes which can afford auxiliary part-season gas heating. They want all the comfort and convenience they can afford. There is here a latent demand for thousands of auxiliary gas heating installations whose gas consumption possibilities run to a tremendous total.

Next consider auxiliary gas heaters in their relationship to present public buying moods. If ever gas house-heating needed new stimulus, fresh advertising and sales appeal, now is that time. It is imperative for live sales departments to find new and broader sales fields. Auxiliary gas heaters offer an untapped reservoir of possible orders. It can well give needed life and pep to the sales force.

The gas load characteristics of auxiliary heaters are especially attractive. They consume gas in the off peak periods of the house-heating load. When the extreme weather periods of winter come the conversions and gas designed central heaters demand all the gas they can consume, but auxiliary heaters are turned off. This enables a larger house-heating load to be taken on for a given plant or gas main capacity. Streets or sections of the city in which the existing mains are loaded to capacity can be loaded up with a still larger annual house-heating load, if the added load is an auxiliary heating load. Long transmission lines can bring bigger returns on their investment if part of their load is an auxiliary heating load.

Since the past history of gas house-heating has shown a constant broadening of the sales avenues, and since the auxiliary heater rounds out the house-heating program—offering a means to reach the masses—it is certain to be widely accepted by the gas industry as the needed fourth link in the chain. Several auxiliary heaters are now on the market. It is known that several other manufacturers will enter this field. All evidences point to auxiliary gas heating as being the outstanding development in house-heating of the present and immediate future.

On the Determination and Calculation of Humidity in Air and the Common Fuel Gases

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HUMIDITY effects are receiving increasing attention from the gas engineer as their role in phases of his work becomes better understood, and methods for quantitative measurement of humidity in various gases are consequently assuming more importance in this field.

Humidity measurements show the relative tendency of water to vaporize or condense, and are expressed as percentage fractions of saturation. In other words, when the gaseous atmosphere holds so much water vapor that the further addition of water vapor (other conditions remaining constant) is accompanied by condensation, the humidity is denominated 100%. In meteorological practice, the conception is essentially one of relative partial pressures of water vapor. At saturation, the water vapor in the atmosphere has attained the pressure exerted by pure water at the temperatures in question. This value is readily ascertained by consulting a vapor pressure table for water. Humidities below saturation denote water vapor pressures as percentage fractions of the saturation pressure.

Any thoughtful consideration of humidity effects will readily indicate that these control the tendency of materials to "dry out" or become "damp." Many materials possess the property of taking up water from gaseous atmospheres in which the humidity is well below saturation. Familiar examples in every-day life are wood and common salt. At low humidities the wood shrinks and the salt shakes and pours readily, at high humidities, the wood swells as liquid water is taken into its pores, and the salt cakes as the water is taken up from the atmosphere to form a solution, or the salt deliquesces.

Practical Aspects

To the gas engineer a number of important phenomena are closely linked with drying out or dampening effects. The shrinking of porous joint packing at low humidities due to the drying of the yarn caused by the introduction of natural gas of low humidity into mains formerly tight when used for moist manufactured gas is well established and regularly combatted by re-humidifying the natural gas after it is expanded to low pressure. On the other hand, the role of high humidities in causing liquid water films which promote corrosion has led to the development of drying processes in which some water vapor is removed from manufactured gas. A recent study at this University has shown the great importance of proper humidity conditions in maintaining the proper functions in iron oxide purification for the removal of hydrogen sulfide.[3] In the utilization of gas, the partial dehumidification of the air in homes and offices and the control of humidity in certain manufacturing operations have assumed considerable importance.

For the determination of humidity a variety of methods are available. Those requiring the direct determination of the gaseous water pressures or the direct determination of the absolute weight of water vapor in a given weight of gas are generally deemed inconvenient.

Hygrometer and Its Use

There is a general preference for those methods which determine the humidity by measuring the power of the atmosphere to evaporate liquid water. As this vaporization is accompanied by a considerable heat change, the most convenient instrument or hygrometer generally consists of two thermometers, one of which has a dry and one a wet bulb. Obviously, if the atmosphere is saturated with water vapor there will be no evaporation of water from the wet bulb, consequently it will register the same temperature as the dry bulb. If on the other hand the water vapor content of the atmosphere is very low compared with the content which can exist at saturation, there will be a considerable evaporation, and a correspondingly large difference in temperature between the two thermometers.

Moreover, if the velocity of the gaseous atmosphere passing the thermometer bulbs is sufficient to cause a rapid evaporation of the water at the wet bulb, the lowering of the temperature of this bulb will be substantially adiabatic; *i.e.*, dependent on the heat changes caused by the evaporation of the water into the gaseous atmosphere. From this the water vapor content of the gaseous atmosphere (and hence its humidity) may readily be calculated. The equation governing the heat effects of this evaporation when the atmosphere is air has been expressed by Carrier[4] as follows:

$$r(W' - W) = Cp_a(t - t') + Cp_w W(t - t') \qquad \text{Equation (1)}$$

where

r = latent heat of water at the wet bulb temperature t'

W' = absolute water vapor content of saturated air at the wet bulb temperature t' in pounds per pound of air

[1] Technical Assistant.
[2] Professor.

[3] Huff and Milbourne: Proc. Am. Gas Assoc. 1930, p. 856; Ind. Eng. Chem. *22*, 1213 (1930)
Milbourne: Dissertation, J. H. U. 1930.

[4] "Rational Psychiometric Formulæ," Trans. A. S. M. E. *33*, 1005 (1911).

W = absolute water vapor content of the air at the temperature t expressed in pounds per pound of air
t = the dry bulb temperature in ° F.
t′ = the wet bulb temperature
Cp_a = the specific heat of air per pound
Cp_s = the specific heat ot water vapor per pound.

To fulfill the conditions demanded by the above equation, the process must be adiabatic, the water must all be evaporated at the true wet bulb temperature, and the air must reach saturation at the true wet bulb temperature. As a necessary part of the adiabatic conditions, the thermometer bulbs must be screened from radiation and the saturated air must be removed promptly from the region immediately surrounding the wet bulb. At a linear gas velocity of 2000 feet per minute the departure from these conditions does not cause an error much more than 1 per cent of the wet bulb depression, which is sufficiently accurate for all ordinary engineering purposes.

Simplification of Calculations

For use with the above equation there are available a number of tables[5] applicable to the conditions found in air at a total atmospheric pressure of 29.92" Hg. The base quantity of air is 1 pound, a convenient unit for many engineering calculations as such a fixed quantity of air is readily handled without reference to the volume changes due to temperature and pressure. For various gases, however, no tables are readily available, and the engineer is often obliged to resort to rather involved calculations. This paper will endeavor to show how such calculations may be simplified and much of the advantage derived, from the air tables utilized in the gas calculations.

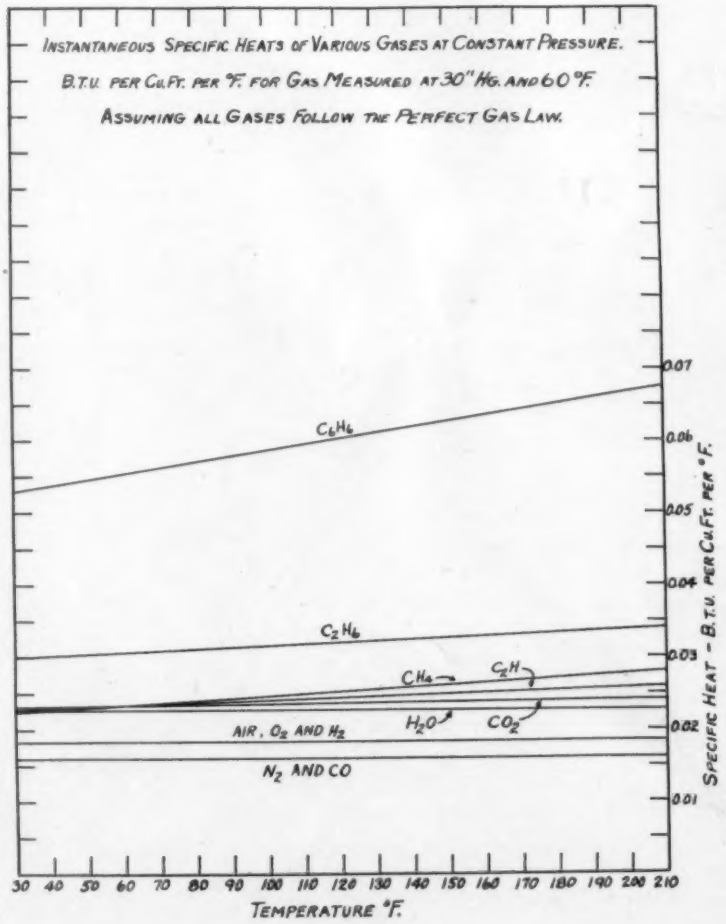


Figure 1

The fundamental relationships expressed by Equation 1, namely that the latent heat required to evaporate the water at the wet bulb to saturation is equal to the heat lost by the dry gaseous atmosphere plus the heat lost by the water vapor it carries as these cool from the dry bulb to the wet bulb temperature, applies irrespective of the gas composing the atmosphere, but to facilitate comparison with standard tables it is desirable to choose the gas quantity such that the volume of gas considered is equal in volume to that of a pound of air under similar conditions rather than a pound of the gas. By this expedient, the water vapor content at saturation is the same for the air and the gas, since the absolute amount of water vapor which may be evaporated into a given atmosphere at a given temperature is determined by the volume of the atmosphere and not its weight. The only change thus introduced into Equation 1 for the gas is the change due to differences in the value of the specific heat and weight of gas compared to that of air. This change is readily computed by multiplying the value Cp by the ratio

$$\frac{\text{volumetric specific heat of gas}}{\text{volumetric specific heat of air}}$$

This ratio, once determined, is sufficiently constant with diatomic gases such as H_2, N_2, O_2 and CO to be used unchanged in subsequent engineering calculations involving the ordinary range of temperatures, and for mixed gases containing small amounts of CO_2 or methane it may also be regarded as constant. In fact, no serious error is introduced if the temperature range is small if it be treated as a constant for all gases. The only precaution to be emphasized is to recall that the values apply to *a volume of gas equal to the volume of a pound of air,* and not to a pound of the gas. Figure 1 gives values for the instantaneous specific heats of several gases in B.t.u. per cubic foot measured at 30" Hg and 60°F.

The following will illustrate the method of calculation for a gas having the following analysis (a 500 B.t.u. carburetted water gas):

	Analysis by volume	Instantaneous sp. ht. per cu. ft. of gas at 30" Hg and 60° F.[6]		Product
CO_2	3.4	.0236		.0802
Ill.	8.6	.0422[7]		.3629
O_2	0.5	.0183		.0092
CO	32.6	.0160		.5216
H_2	38.2	.0183		.6993
CH_4	8.0	.0252		.2016
C_2H_6	2.2	.0320		.0704
N_2	6.5	.0160		.1040
			100	2.0492
				.0205

[5] E.g. "Properties of Steam and Ammonia," G. A. Goodenough, 2nd Ed., Table 6 on mixtures of air and saturated water vapor, and Table 1 giving values for r; see also, Marks Handbook, 2nd Ed. 1924, p. 351.

[6] These values are selected at 120° F.

[7] Assumed equivalent in specific heat to ½ ethylene and ½ benzene, this value changes with changes in the composition of the illuminants and is generally somewhat lower than that assumed.

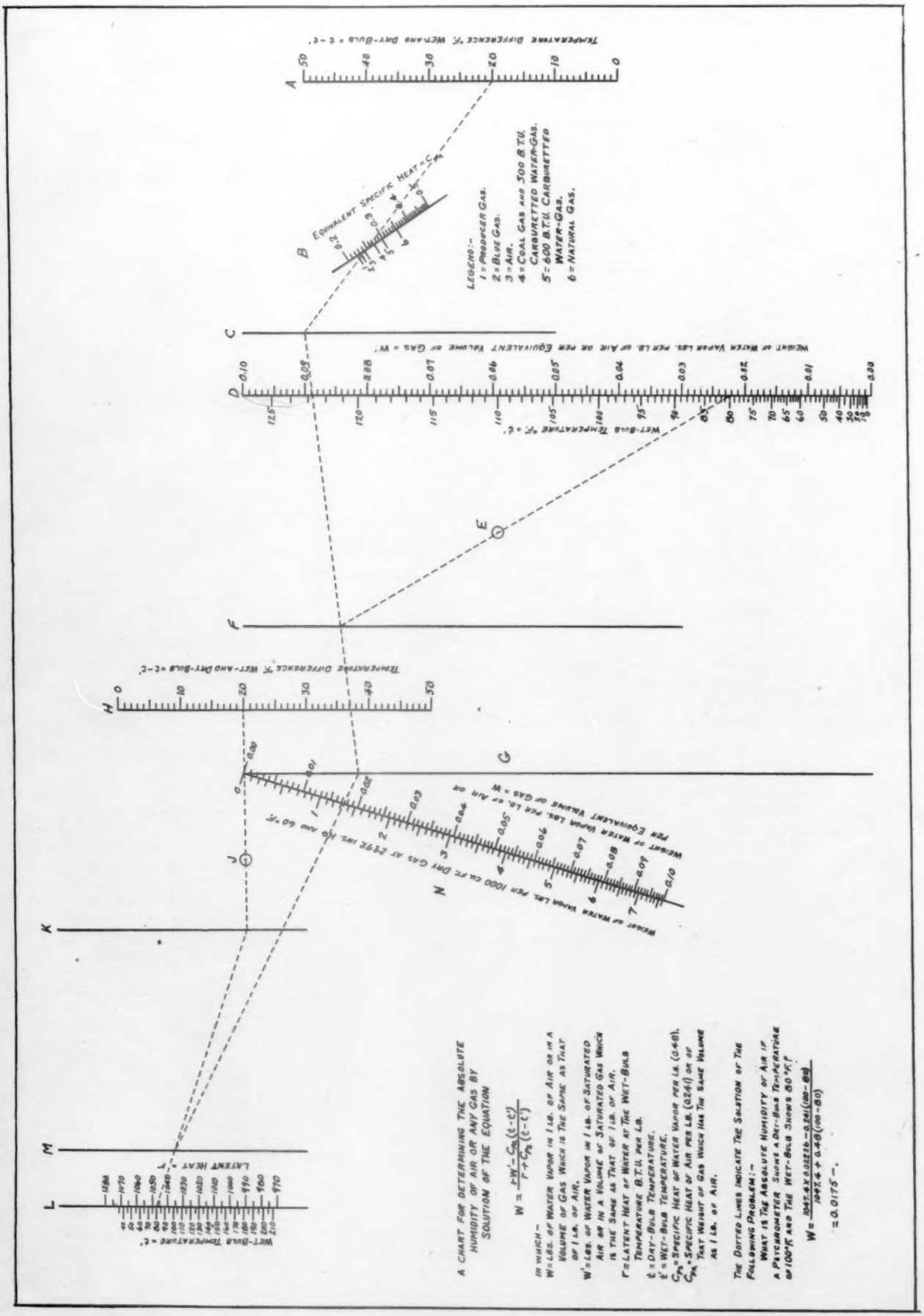

A CHART FOR DETERMINING THE ABSOLUTE HUMIDITY OF AIR OR ANY GAS BY SOLUTION OF THE EQUATION
$W = \frac{rW' - C_{pa}(t-t')}{r + C_{pv}(t-t')}$
IN WHICH—
W = LBS. OF WATER VAPOR IN 1 LB. OF AIR OR IN A VOLUME OF GAS WHICH IS THE SAME AS THAT OF 1 LB. OF AIR.
W' = LBS. OF WATER VAPOR IN 1 LB. OF SATURATED AIR OR IN A VOLUME OF SATURATED GAS WHICH IS THE SAME AS THAT OF 1 LB. OF AIR.
r = LATENT HEAT OF WATER AT THE WET-BULB TEMPERATURE B.T.U. PER LB.
t = DRY-BULB TEMPERATURE.
t' = WET-BULB TEMPERATURE.
C_{pa} = SPECIFIC HEAT OF WATER VAPOR PER LB. (0.48).
C_{pv} = SPECIFIC HEAT OF AIR PER LB. (0.241) OR OF THAT WEIGHT OF GAS WHICH HAS THE SAME VOLUME AS 1 LB. OF AIR.
THE DOTTED LINES INDICATE THE SOLUTION OF THE FOLLOWING PROBLEM:—
WHAT IS THE ABSOLUTE HUMIDITY OF AIR IF A PSYCHROMETER SHOWS A DRY-BULB TEMPERATURE OF 100°F. AND THE WET-BULB SHOWS 80°F.?
$W = \frac{1047.4 \times 0.0335 - 0.241(100-80)}{1047.4 + 0.48(100-80)}$
$= 0.0175$ —.
LEGEND:—
1 = PRODUCER GAS.
2 = BLUE GAS.
3 = AIR.
4 = COAL GAS AND 300 B.T.U. CARBURETTED WATER-GAS.
5 = 600 B.T.U. CARBURETTED WATER-GAS.
6 = NATURAL GAS.
TEMPERATURE DIFFERENCE °F. WET-AND DRY-BULB = t − t'
EQUIVALENT SPECIFIC HEAT = C_{pa}
WEIGHT OF WATER VAPOR LBS. PER LB. OF AIR OR PER EQUIVALENT VOLUME OF GAS = W'
WET-BULB TEMPERATURE °F. = t'
WEIGHT OF WATER VAPOR LBS. PER 1000 CU. FT. DRY GAS AT 2592 INS. HG AND 60 °F.
WEIGHT OF WATER VAPOR LBS. PER LB. OF AIR OR PER EQUIVALENT VOLUME OF GAS = W
TEMPERATURE DIFFERENCE °F. WET-AND DRY-BULB = t − t'
LATENT HEAT = r'
WET-BULB TEMPERATURE = t'

Figure 2

The ratio of the specific heat of this gas to air is $\frac{.0205}{.0183}$ or 1.120. Then an equivalent specific heat for that weight of gas which occupies the same volume as 1 pound of air would be .241 x 1.12 or .270 and the equation becomes:

$$r(W' - W) = .270(t - t') + .48W(t - t')$$

In applying this equation it is customary to have the wet and dry bulb temperatures and solve for the value W. Rearranging the equation as a solution for W and using symbols we get:

$$W = \frac{rW' - Cp_s(t - t')}{r + Cp_s(t - t')} \qquad (2)$$

To facilitate such calculations a graphical chart has been developed and is shown in Figure II.

Use of the Graphical Chart

The method of using the graphical chart is demonstrated by the dashed lines indicating the determination of the absolute water vapor content of air when the dry bulb temperature is 100°F. and the wet bulb temperature is 80°F. The value of t — t' or 20 on the A scale is connected with the point .241 (.270 in the case of the gas given above) on the B scale to determine the product Cp_s (t — t') on the ungraduated C scale. The product rW' is obtained in the same manner on the ungraduated F scale from the value t' on the D scale and the point E. The points on the C and F scales then determine the value of rW' — Cp_s (t — t') on the ungraduated G scale.

The value of r + Cp_s (t — t') is determined in a similar manner using the H scale and the point J to determine Cp_s (t — t') on the K scale and this point is then joined with the value of t' (r) on the L scale to determine the sum on the ungraduated M scale.

The points on the M scale and G scale are then used to determine the absolute water vapor content on the N scale. The value determined is .0174 against .0175 by mathematical solution.

For use in gas engineering, the B scale for the equivalent specific heat value of Cp_s is also graduated with average points for use with various types of commercial gases.

In a like manner the N scale is graduated on one side with the weight of water vapor contained in the volume equivalent to the volume of 1 pound of air while the other side is graduated in the weight of water vapor per 1000 cubic feet of bone dry gas measured at 29.92" Hg and 60°F. Due to the nature of the data from which the calculations were made it was impossible to register this scale at 30" Hg and 60°F. which the gas industry has generally adopted. The error introduced in any case is within that to be expected and may be neglected.

The chart is limited to use at pressures of 29.92" Hg but may be used over slight variations from this pressure. In many manufactured gas plants, the gas pressures seldom vary from atmospheric by more than a few inches of water so that no serious errors will be introduced by determining the wet and dry bulb temperatures under the pressures encountered.

In the case of higher pressures, the water actually carried may be determined independently of the pressure to which the gas is subjected because the hygrometer may be placed on a bleed sample line in which the gas is expanded to atmospheric pressure and the absolute water vapor content calculated per 1000 cubic feet of dry gas at 29.92" Hg and 60°F. which is the usual standard.

Calculations on Gases at Various Pressures

The foregoing equations may be adapted for engineering calculations at any ordinary pressure if one bears in mind the fact that the total weight of water carried at saturation for any temperature is a constant for the specific volume irrespective of the total pressure on the system; *i. e.*, for a given volume at a given temperature W' is constant. Adopting again the expedient of choosing for reference the volume of 1 pound of air at 29.92" Hg, the values for Equation 1 need only be modified by multiplying the value of the specific heat of the gas determined for 29.92" by the ratio $\frac{P_1}{29.92}$ in which P_1 is the total system pressure. Thus, if the total system pressure becomes 40" Hg in the example of carburetted water gas cited the value .270 for 29.92" becomes $.270 \times \frac{40.0}{29.92} = .361$ and the equation becomes

$$r(W' - W) = .361(t - t') + .48(t - t')$$

It must be remembered that the water vapor content is calculated for that volume of gas at 40" Hg and the respective dry bulb temperature which would be occupied by 1 pound of air at the dry bulb temperature and 29.92".

Determination of Meteorological Humidity from Absolute Water Vapor Content of Gas

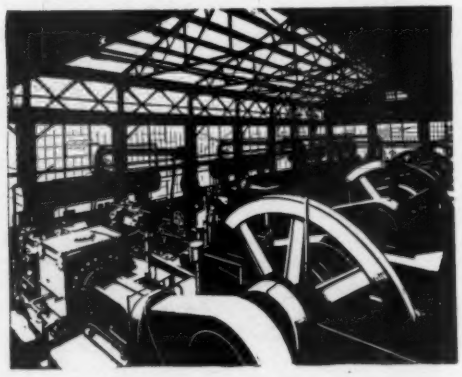
In engineering practice, it has become rather usual to speak of the absolute water vapor content of the gas expressed as pounds of water vapor per pound of gas as the "absolute humidity." As a result there have arisen two concepts of percentage humidity, the initial or meteorological humidity which is a comparison of the partial pressure of the water vapor with the pressure at saturation, while the engineering concept refers to the percentage of water vapor based on a saturation expressed in pounds per pound of gas. A close examination will show that these refer to different total volumes of gas, and consequently have different values. To avoid this confusion, the custom of denominating the absolute vapor content the "absolute humidity" should be discontinued.

As pointed out in the beginning of this discussion, for many purposes the determination of humidity is sought as a measure to indicate whether water will readily condense from or evaporate into the atmosphere; *i. e.*, whether liquid films or "dry" conditions may readily be expected. This is most readily shown by the relative meteorological humidity, and it is desirable to ascertain this relative meteorological humidity from the foregoing calculations on absolute water vapor content.

As the gas stream moves out over the distributing system, it encounters changing dry bulb temperatures, and it is very desirable to determine whether or not the water vapor is approaching condensation, as indicated by the meteorological humidity. Knowing the temperature and total pressure on the system at the point in question and the relative weights of water vapor and gas, and the specific volumes in pounds per cubic foot of both the water vapor and the gas, it is possible to calculate the relative partial pressure of the water vapor by multiplying the total pressure by the ratio

(Continued on page 34)

Water Vapor in Natural Gas



C. H. M. BURNHAM

Vice-Pres. Colorado-Wyoming Gas Company

(Continued from June issue)

THE foregoing discussion has dealt with the subject matter purely from a pipe line transportation standpoint. It is to be remembered, however, that the natural gas not only must be transported but must be marketed, and in the process of being marketed it travels through many miles of pipe in the thousands of miles of mains constituting the gas distribution systems of our many American cities served with natural gas. In the following discussion it will be the purpose of this paper to treat the subject from the distribution engineer's point of view; i.e., as to the effect the presence or absence of water vapor in natural gas has upon the pipes, pipe joints, domestic meters, regulators, and miscellaneous equipment constituting the greatest part of the gas distribution company's underground investment, and through which the natural gas is conducted to the customers' appliances.

Generally speaking, gas distribution systems are constructed of cast-iron pipe, steel pipe, or a combination of both. It is usually found, that the cast-iron pipe used in the underground gas system was laid years ago, before wrought iron and steel pipe came into general use, and before the rubber gasket type of joint was used in laying cast-iron pipe.

By far, the most common joint used in laying cast-iron gas mains was the old bell and spigot type of joint, constructed of lead and jute. In laying steel mains, the screw collar, the patent plain end coupler with rubber gaskets, and the welded joint are the most common methods of joining.

Influence of Dew Point

Chemists have proved that to avoid corrosion in steel lines when oxygen is present, the gas must be kept above the dew point, or, conversely, the dew point kept below the temperature of the gas.

While cast-iron pipe, due to the nature of its material, is immune from moisture troubles as far as the corrosion side of the question is concerned, the lead and jute joint is extremely susceptible to the physical characteristics of the gas carried. This is especially true, and the effect is quite evident, if the cast-iron mains in question at one time carried manufactured gas, only to have it supplanted by natural gas.

Manufactured gas is not only water saturated, but carries many compounds such as tar oils and naphthalene, and others more or less easily condensed.

In the process of carrying manufactured gas, the joint material becomes saturated first with water, then with napthalene and various condensates. It has been demonstrated that the lead in the joint plays a very small part in making the joint gas-tight, but does provide a substantial support for the jute. The jute swells and makes and maintains an ideal joint; viz, a gas-tight joint. In the case of steel pipe, the interior of the pipe becomes coated, obviating any corrosion, and the joints are cemented or gummed over with the tar and napthalene. Under these conditions, a distribution system of steel pipe, cast-iron pipe, or a combination of the two, would be fairly tight *and moist*. The same may be said in regard to the meter diaphragms and regulator diaphragms which, through contact with a saturated gas, will have absorbed quantities of water, tar oil, and other condensates carried by the manufactured gas.

In the event natural gas is introduced into such a distribution system, supplanting the manufactured gas, as has been done recently in many cities in the South, Middle West, and West, a condition is set up which, if allowed to continue, may involve a great expense, first, in gas lost, and second, in remedial measures that must be taken to correct the leakage setup.

The condition referred to is the drying-out effect caused by the but-partially-saturated natural gas. Although at the point of delivery, near the city border, the gas may be saturated, in the low-pressure distribution mains where it is customary to carry but 6 to 10 inches of water pressure the degree of humidity will be considerably decreased, due to the change in pressure.

The distribution plant at Denver, Colorado, up until August, 1928, had carried for nearly a half-century saturated manufactured gas, and it was anticipated that joint trouble would arise upon the introduction of natural gas. A definite procedure was, therefore, detererably decreased, due to the change in pressure.

Samples of jute were removed from the cast-iron bell and spigot joints in various locations on Denver's distribution system. These samples, enclosed in air-tight containers and properly labeled were sent to a central laboratory for analysis, with the result that they were found to contain 18 to 28%, by weight, of water; about 6% of light hydrocarbons; and 0.2% naphthalene.

Keeping Joints Unchanged

Previous experience in Fort Collins, Colorado, Cheyenne, Wyoming, and Shreveport, Louisiana, coupled with the results of these Denver laboratory tests, indicated the importance of sending only saturated gas through Denver's distribution system. Experience at Cheyenne also had shown that once a system is allowed to dry out and is leaking badly, the original condition of the joints cannot be restored. A program was, therefore, determined upon to treat Denver's nat-

Read before convention of Natural Gas Dept., A. G. A., Tulsa, Okla., May 9-11, 1932.

ural gas supply in such manner that the condition of the joints would remain unchanged.

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To duplicate exactly the physical characteristics of these tar oils was known to be practically impossible. On the other hand, Dalton's Law indicated that if they were not exactly duplicated, they would in time leave the joint. A light gas oil was chosen, not with a great deal of confidence that it would prevent the evaporation of the light hydrocarbons in the joints, but it was hoped that it would itself be absorbed and in a way replace the naturally deposited condensates. It was known, however, that the injection of oil would tend to cement the scale and rust to the pipe walls.

Inasmuch as Denver's natural gas supply contains no oxygen, there was no possibility of setting up a corrosive condition by the introduction of water.

It goes without saying that in order that no water be evaporated from the pipe joints, the gas must approach 100% humidity. This means it should be water saturated at the temperature of the main.

Since the pressure at the point of saturation is somewhat higher than the average main pressure, being in most cases near the center of distribution, it is usually advisable to warm the gas and saturate it at slightly above main temperature. As the pressure decreases at a distance from the point of regulation, the temperature drop will compensate the drop in pressure and the degree of humidity will be maintained.

Methods of Saturation

There are several ways by which the gas may be water saturated. However, in any case heat must be added in one form or another in an amount, first, to evaporate the quantity of water by which the gas is deficient, and, second, to raise the temperature of the gas to, or slightly in excess of, that of the underground mains. Should the gas be sent out saturated at a temperature lower than that of the gas mains, in the process of warming up to ground temperature the per cent humidity will decrease and the effect of saturation will be less. The amount of heat required is developed by a simple calculation, an example of which follows.

Assume that the gas is delivered at the district regulator station at 60° F., 25-lb. gauge, 50% humidity, and that the main pressure is 8 oz., with a ground temperature of 60° F.

Radiation and other heat losses prevent the gas expanding through the regulator adiabatically and the temperature on the downstream side, therefore, cannot be computed with any degree of certainty. However, experience has indicated that this drop in temperature rarely, if ever, reaches 15° F. Under normal conditions, observations have shown a drop of but 5° F. when the gas is expanded from 25-lb. gauge down to 8 oz.

Assume a barometric pressure of 14.4 lb., at which the per cent humidity, h_2, of the gas on the outlet of the regulator will be

$$h_2 = 50 \frac{0.5 + 14.4}{25 + 14.4} \times \frac{0.5214}{0.4356} = 22.8\%$$

in which

0.5214 = Vap. pres. in inches merc. at 60° F

0.4356 = Vap. pres. at 55° F.

The foregoing formula is developed as follows:

$$\frac{h_1 V_1 S_1}{T_1} = \frac{h_2 V_2 S_2}{T_2} \text{ and } \frac{h_1}{h_2} = \frac{V_2 S_2}{V_1 S_1} \frac{T_1}{T_2}$$

where

h is relative humidity

V is volume of water vapor

S is vapor pressure of water in inches of mercury.

But

$\frac{V_2}{V_1} = \frac{P_1 T_2}{P_2 T_1}$ Where P and T are absolute pressures and temperatures

Substituting the value of $\frac{V_2}{V_1}$

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Knowing the humidity of the gas under any one condition, it can be calculated for any other condition by means of the above formula, provided of course, no water is precipitated or added.

At 100 per cent humidity, 64 deg. fahr., and 14.4 lb., plus 0.5 absolute pressure, the gas will contain 0.943 lb. of water vapor per thousand cubic feet; and at 55 deg. fahr., 0.699 lb. In the above case, it will accordingly be necessary to evaporate 0.943 — (.226 × .699) or 0.785 lb. of water per thousand cubic feet of gas representing the difference between the water the gas already carries and the water it will carry when saturated. Since it is assumed that a 5 degree drop in temperature takes place in the regulator and that the temperature of the gas leaving the saturating equipment is to be maintained at 4 degrees above main temperature, the temperature of the gas must accordingly be raised 9 degrees. Therefore, the theoretical amount of heat required per thousand cubic feet will be

$$0.785 \times 1055.1 + (1000 \times 0.02627 \times 9) = 1064.7 \text{ B.t.u.}$$

The specific heat of this natural gas being about 0.02627 B.t.u. per cubic foot, at 14.9 lb.

Supplying this amount of heat, both to warm the gas and evaporate the water, may be accomplished in one of several ways. For instance, by the injection of a sufficient amount of steam; by contacting or scrubbing the gas with warm water; or by a combination of these methods. In any event, the heat requirements will be identical.

Suppose, in the case cited above, that a supply of saturated steam is available at 50 lb. gauge pressure. Upon injection into the gas stream, the steam will be first super-heated through expansion; then, upon giving up its heat to the gas, it will condense, then evaporate. However, it does not necessarily all condense.

The total heat in steam at 50 lb. gauge, or 64.4 lb. absolute, is 1178.33 B.t.u. At 64 deg. fahr. (its final condition), the partial pressure exerted by the steam or water vapor will be 0.2949 lb. absolute, and its total heat content will be 1087.6 B.t.u. per pound.

The amount of steam at 64.4 lb. absolute pressure necessary to accomplish the saturation and heating in this case is determined as follows:

1178.3 — 1087.6 = 90.7 B.t.u. per pound given up by the steam, which does not condense.

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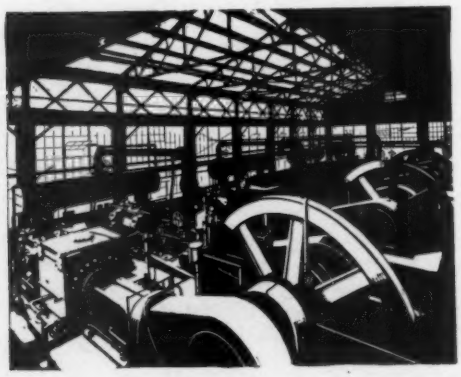
Water Vapor in Natural Gas



C. H. M. BURNHAM
Vice-Pres. Colorado-Wyoming Gas Company

(Continued from June issue)

THE foregoing discussion has dealt with the subject matter purely from a pipe line transportation standpoint. It is to be remembered, however, that the natural gas not only must be transported but must be marketed, and in the process of being marketed it travels through many miles of pipe in the thousands of miles of mains constituting the gas distribution systems of our many American cities served with natural gas. In the following discussion it will be the purpose of this paper to treat the subject from the distribution engineer's point of view; i.e., as to the effect the presence or absence of water vapor in natural gas has upon the pipes, pipe joints, domestic meters, regulators, and miscellaneous equipment constituting the greatest part of the gas distribution company's underground investment, and through which the natural gas is conducted to the customers' appliances.

Generally speaking, gas distribution systems are constructed of cast-iron pipe, steel pipe, or a combination of both. It is usually found, that the cast-iron pipe used in the underground gas system was laid years ago, before wrought iron and steel pipe came into general use, and before the rubber gasket type of joint was used in laying cast-iron pipe.

By far, the most common joint used in laying cast-iron gas mains was the old bell and spigot type of joint, constructed of lead and jute. In laying steel mains, the screw collar, the patent plain end coupler with rubber gaskets, and the welded joint are the most common methods of joining.

Influence of Dew Point

Chemists have proved that to avoid corrosion in steel lines when oxygen is present, the gas must be kept above the dew point, or, conversely, the dew point kept below the temperature of the gas.

While cast-iron pipe, due to the nature of its material, is immune from moisture troubles as far as the corrosion side of the question is concerned, the lead and jute joint is extremely susceptible to the physical characteristics of the gas carried. This is especially true, and the effect is quite evident, if the cast-iron mains in question at one time carried manufactured gas, only to have it supplanted by natural gas.

Manufactured gas is not only water saturated, but carries many compounds such as tar oils and naphthalene, and others more or less easily condensed.

In the process of carrying manufactured gas, the joint material becomes saturated first with water, then with napthalene and various condensates. It has been demonstrated that the lead in the joint plays a very small part in making the joint gas-tight, but does provide a substantial support for the jute. The jute swells and makes and maintains an ideal joint; viz, a gas-tight joint. In the case of steel pipe, the interior of the pipe becomes coated, obviating any corrosion, and the joints are cemented or gummed over with the tar and napthalene. Under these conditions, a distribution system of steel pipe, cast-iron pipe, or a combination of the two, would be fairly tight *and moist*. The same may be said in regard to the meter diaphragms and regulator diaphragms which, through contact with a saturated gas, will have absorbed quantities of water, tar oil, and other condensates carried by the manufactured gas.

In the event natural gas is introduced into such a distribution system, supplanting the manufactured gas, as has been done recently in many cities in the South, Middle West, and West, a condition is set up which, if allowed to continue, may involve a great expense, first, in gas lost, and second, in remedial measures that must be taken to correct the leakage setup.

The condition referred to is the drying-out effect caused by the but-partially-saturated natural gas. Although at the point of delivery, near the city border, the gas may be saturated, in the low-pressure distribution mains where it is customary to carry but 6 to 10 inches of water pressure the degree of humidity will be considerably decreased, due to the change in pressure.

The distribution plant at Denver, Colorado, up until August, 1928, had carried for nearly a half-century saturated manufactured gas, and it was anticipated that joint trouble would arise upon the introduction of natural gas. A definite procedure was, therefore, detererably decreased, due to the change in pressure.

Samples of jute were removed from the cast-iron bell and spigot joints in various locations on Denver's distribution system. These samples, enclosed in air-tight containers and properly labeled were sent to a central laboratory for analysis, with the result that they were found to contain 18 to 28%, by weight, of water; about 6% of light hydrocarbons; and 0.2% naphthalene.

Keeping Joints Unchanged

Previous experience in Fort Collins, Colorado, Cheyenne, Wyoming, and Shreveport, Louisiana, coupled with the results of these Denver laboratory tests, indicated the importance of sending only saturated gas through Denver's distribution system. Experience at Cheyenne also had shown that once a system is allowed to dry out and is leaking badly, the original condition of the joints cannot be restored. A program was, therefore, determined upon to treat Denver's nat-

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Since 0.785 lb. of water is required per thousand cubic feet, the heat input to supply this amount of water will be

$$0.785 \times 90.7 = 71.2 \text{ B.t.u}$$

But $1000 \times .02627 \times 9 = 236.4$ B.t.u. which must be supplied per thousand cubic feet to raise the temperature of the gas from 55 deg. fahr. to 64 deg. fahr. Therefore, an additional amount of steam must be supplied which will condense, since the gas already will be saturated. This additional steam, which condenses, will be equal in quantity to the steam required to supply the amount of heat by which the steam required for saturation is deficient.

236.4 — 71.2 = 165.2 B.t.u. the heat deficiency.

1178.33 — 32.07 = 1146.26 B.t.u., the heat of 64.4 lb. abs. steam above 64 deg. fahr. Therefore

$$\frac{165.2}{1146.26} = 0.144 \text{ lb. steam required.}$$

It follows, then, that the total steam requirements for saturating a thousand cubic feet of this gas are $0.785 + 0.144 = 0.929$ lb.

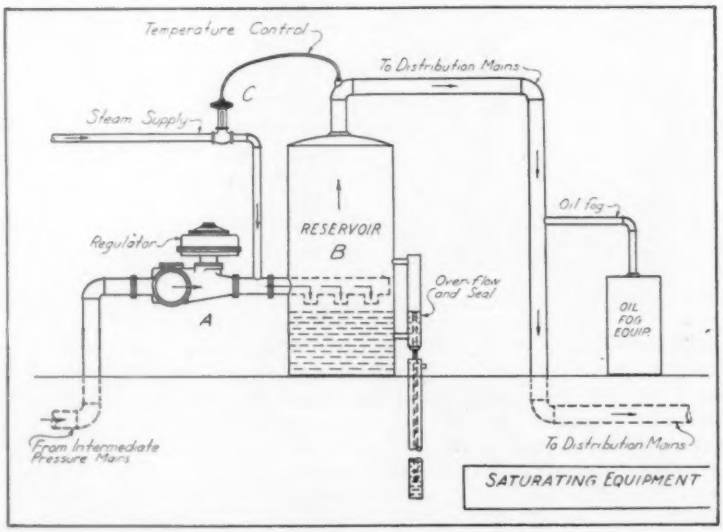


Figure 5

As to the design of practical installations, provision must be made to prevent the gas stream carrying any considerable amount of suspended water into the gas distribution system. This is accomplished by slowing down the gas stream to such velocity that the suspended water will settle out. A large vertical reservoir, the size of which depends on the amount of gas handled, offers a simple means to this end. Such apparatus is shown in Fig. 5.

Referring to Fig. 5, the gas, after having its pressure reduced to distribution pressure in regulator A, receives at the outlet of the regulator a supply of steam which is controlled by thermostatic valve C. The thermostatic valve is set to maintain some predetermined temperature at the outlet of the apparatus, usually 3 to 5° in excess of the ground temperature. After receiving its supply of steam, the gas enters reservoir B where the excess moisture settles out;—thence it passes into the distribution system.

The above method of saturation is in successful operation in Colorado, where it was first introduced. The degree of its success may be best attested to by those attending the distribution conferences, where it is not unusual to have Denver's leakage record cited as "miraculous."

On the Determination and Calculation of Humidity in Air and the Common Fuel Gases

(Continued from page 31)

$$\frac{\text{volume of the water vapor}}{\text{sum of volume of water vapor + volume of gas}}$$

Knowing this partial pressure, by consultation of a table of vapor pressures of water, the meteorological humidity is ascertained by dividing the partial pressure by the vapor pressure of water at the temperature in question, care being taken to express these pressures in the same units. The quotient multiplied by 100 gives the percentage humidity.

Where the system is at atmospheric pressure (29.92" Hg), the meteorological humidity can be ascertained very simply by noting in a table the dew point temperature, i. e., the temperature at which W corresponds to the values for saturated conditions, then noting the saturation pressure corresponding to this dew point temperature. This pressure is then divided by the saturation pressure at the dry bulb temperature, and the quotient multiplied by 100 to give the meteorological humidity. Thus in the numerical example cited above, where the dry bulb is at 100°F. and the wet bulb 80°F., reference to Goodenough's table[5] will show that the calculated value for W — 0.175 pounds water per pound of dry air corresponds to a dew point of 73°F. at which temperature the saturation pressure for water is .8177" Hg. The saturation pressure at 100°F. is 1.931" Hg

and the quotient $\frac{.8177}{1.931}$ multiplied by 100 shows 42.3%

for the true or meteorological humidity.

The percentage absolute water vapor content, often called the percentage absolute humidity, at low temperatures (i. e. below about 100°F.) does not differ much from this figure and is ascertained readily by dividing W by the value of W′ corresponding to the temperature of the part of the system in question. These values of W′ may be taken from scale D in the chart shown. In the numerical example given, the value of W is .04305 and W′ is 0.0175 pounds water vapor per pound dry air giving the percentage absolute water vapor content of 40.6%.

Coke and By-Products in 1931

THE United States Bureau of Mines has recently issued data on the coke industry for the past year, the same being based on complete returns received from producers. Below will be found some pertinent tabulations taken from the Bureau's report:

Salient Statistics of the Coke Industry in 1931

	By-product	Beehive	Total
Coke produced:			
Quantity ..... net tons	32,355,549	1,128,337	33,483,886
Value	$ 158,090,123	$ 3,518,601	$ 161,608,724
Screenings and breeze produced:			
Quantity ..... net tons	3,126,285	49,432	3,175,717
Value	$ 6,637,976	$ 73,809	$ 6,711,785
Coal charged into ovens:			
Quantity ..... net tons	46,846,277	1,766,783	48,613,060
Value	$ 166,161,532	$ 2,758,198	$ 168,919,730
Average Value	$ 3.55	$ 1.56	$ 3.47
Average yield in per cent of coal charged:			
Coke	69.07	63.86	68.88
Breeze (at plants actually recovering)	6.67	4.81	6.63
Ovens:			
In existence Jan. 1.	12,831	23,907	36,738
In existence Dec. 31.	13,108	21,588	34,696
Dismantled during year	—	2,357	2,357
In course of construction Dec. 31.	—	—	—
Daily capacity of ovens Dec. 31. .....net tons	173,948	(a)	(a)
Coke used by operator:			
In blast furnaces—			
Quantity ..... net tons	16,622,325	—	16,622,325
Value	$ 68,650,546	—	$ 68,650,546
For other purposes—			
Quantity ..... net tons	1,691,407	233	1,691,640
Value	$ 10,684,995	$ 586	$ 10,685,581
Disposal of coke:			
Sold for furnace use to affiliated corporations—			
Quantity ..... net tons	1,123,349	64,105	1,187,454
Value	$ 5,039,315	$ 229,199	$ 5,268,514
Merchant sales of furnace coke—			
Quantity ..... net tons	703,312	403,444	1,106,756
Value	$ 3,227,742	$ 1,101,945	$ 4,329,687
Sold for foundry use—			
Quantity ..... net tons	1,106,518	250,758	1,357,276
Value	$ 6,763,737	$ 984,356	$ 7,748,093
Sold for domestic use—			
Quantity ..... net tons	8,376,652	118,665	8,495,317
Value	$ 47,957,814	$ 297,839	$ 48,255,653
Sold for manufacture of water gas—			
Quantity ..... net tons	594,339	28,578	622,917
Value	$ 3,668,437	$ 71,981	$ 3,740,418
Sold for industrial and other use—			
Quantity ..... net tons	957,274	258,375	1,215,649
Value	$ 5,201,376	$ 921,203	$ 6,122,579
Disposal of screenings and breeze:			
Used by operator—			
Quantity ..... net tons	2,574,304	41,260	2,615,564
Value	$ 5,190,308	$ 11,589	$ 5,201,897
Sold—			
Quantity ..... net tons	642,847	21,029	663,876
Value	$ 1,623,863	$ 28,266	$ 1,652,089
Average receipts per ton sold:			
Furnace coke (merchant sales)	$ 4.589	$ 2.731	$ 3.912
Foundry coke	$ 6.113	$ 3.926	$ 5.709
Domestic coke	$ 5.725	$ 2.510	$ 5.680
For manufacture of water gas	$ 6.172	$ 2.519	$ 6.005
Other industrial coke	$ 5.434	$ 3.565	$ 5.036
Screenings and breeze	$ 2.526	$ 1.342	$ 2.487

(a) No data.

Disposal of Coke-Oven Tar Produced In 1931, In Gallons

Sold:	Furnace plants	Other plants	Total
For use as fuel—			
To affiliated corporations	8,832,204	8,396,041	17,228,245
To other purchasers	27,179,390	13,672,354	40,851,744
For refining into tar products	89,172,194	125,912,390	215,084,584
Used by producer:			
As fuel under boilers	8,677,440		8,677,440
In open-hearth or other metallurgical plants	151,563,367		151,563,367
Refined at plant	30,195,409	2,994,947	33,190,356

By Products Obtained From Coke-Oven Operations in 1931[a]

Product	Unit	Production	Sales Quantity	Sales Value Total	Sales Value Average
Tar	Gallons	450,856,092	273,164,573	$12,440,567	$0.046
Ammonia:					
Sulphate	Pounds	983,614,651	1,007,561,803	12,812,422	.013
Ammonia liquor (NH_3 content)	do	39,089,088	37,347,144	1,465,998	.039
				14,278,420	
Sulphate equivalent of all forms		1,135,971,003	1,156,950,379		
Gas:					
Used under boilers, etc.	M.cu.ft.	[b]524,097,485	132,761,886	13,023,725	.107
Used in steel or affiliated plants	do.		14,274,493	810,673	.057
Distributed through city mains	do.		161,881,123	49,023,725	.303
Sold for industrial use	do.		19,989,961	3,352,095	.168
			328,907,463	67,429,913	.205
Light oil and derivatives:					
Crude light oil	Gallons	[c]122,529,148	8,739,202	710,106	.081
Benzol, crude and refined	do	14,772,297	14,267,081	2,209,839	.155
Motor benzol	do	61,960,025	61,471,006	7,209,157	.117
Toluol, crude and refined	do	11,832,932	12,693,294	3,099,452	.244
Solvent naphtha	do	3,772,025	3,463,950	591,628	.171
Xylol	do	2,028,729	2,074,126	444,850	.214
Other light oil products	do	4,163,028	2,007,860	124,928	.062
		[d]98,529,036	104,716,519	14,389,960	.137
Naphthalene, crude and refined	Pounds	7,622,929	7,360,309	78,946	.011
Tar derivatives:					
Creosote oil, distillate as such	Gallons	13,740,196	13,686,594	1,218,227	.089
Creosote oil in coal-tar solution	do	2,551,402	2,141,073	144,402	.067
Pitch of tar	Net tons	78,983	4,951	30,247	6.109
Other tar derivatives				55,032	
Phenol	Gallons	94,097	110,352	29,783	.270
Other products [e]				97,595	
Value of all by-products sold				[f]110,193,092	

(a) Includes products of tar distillation conducted by coke-oven operators under same corporate name, excepting, however, phenol, and other tar acids produced at Clairton, Pennsylvania. (b) Includes gas wasted and gas used for heating retorts. (c) Refined on the premises to make the derived products shown, 117,625,416 gallons. (d) Total gallons of derived products. (e) Carbolate, crude products, cyanogen, sodium prussiate and sulphur. (f) Exclusive of the value of breeze production, which in 1931 amounted to $6,637,976.

Gas Utility Revenues in April

REVENUES of manufactured and natural gas utilities aggregated $58,929,472 in April 1932, as compared with $62,686,965 in April 1931, a decline of 6 percent, according to reports from 405 companies serving 14,102,466 customers and representing over 90 percent of the public utility distribution of manufactured and natural gas.

Revenues of the manufactured gas companies aggregated $33,219,682 for the month, a drop of 3 percent from a year ago. The natural gas utilities reported revenues of $25,709,790 which were about 9 percent under the figures for April 1931.

Sales of manufactured gas reported for April totaled 31,585,383,000 cubic feet, a decline of 2.5 percent, while natural gas utility sales for the month were 58,704,285,000 cubic feet, a decline of 13.1 percent.

A significant feature of the data on manufactured gas was an increase of more than 17 percent registered in New England in sales of gas for house heating purposes, although the number of house heating customers gained only 2 percent. The East North Central states comprising Illinois, Indiana, Michigan, Ohio and Wisconsin, indicated an increase of nearly 14 percent in this class of sales, although the number of house heating customers in April was practically unchanged from the same month of the preceding year.

New York state was one of the few sections of the country to register a gain in manufactured gas sales. In that state total sales for the month were up 1.2 percent, the result in large part of an increase of some 35 percent in gas house heating sales.

In most sections of the country domestic sales of both manufactured and natural gas receded but little from 1931 levels. Gas sales for industrial-commercial purposes however continued to average from 12 to 15 percent under the preceding year.—*Paul Ryan, A. G. A. Statistician.*

Full Growth of U. S. by 1960 ?

DR. OLIVER E. BAKER, economist of the Department of Agriculture, who has made special study of the population problem with relation to land needs, says the prospect is for a stationary population of 140 to 145 millions in the United States about 1960, provided immigration does not increase or the birth rate rise.

The outlook for either, he says, is not bright. A 10 to 20 per cent deficit in cities in the number of children necessary to maintain a stationary population now is just about balanced by the 50 per cent surplus of children on farms and the 30 per cent surplus in the non-farm rural population, mostly villages.

"Since the proportion of the nation's population which is urban is increasing and the proportion that is rural is decreasing, it appears likely that the birth rate will continue to fall rather than to rise," Dr. Baker says.

He also points out that the outlook for increased immigration is not encouraging, especially so long as there is a considerable amount of unemployment or the threat of unemployment.

Effective Advertising Appeals

Analyzed by The Copy Writer

No. 2—Gas Range Competition

WHENEVER gas company salesmen are gathered together, everybody seems to be talking about the threat from electric cooking. That it represents a real threat in some quarters there is no denying. When and if the issue is drawn, we believe that intelligent advertising, *begun today*, will do more than any other thing to place any gas company in a position where it can compete successfully, even against a rate that would make electricity comparable to gas. It will be fatal to wait until we are faced with the necessity for action. When the public makes up its mind, the battle is already won . . . or lost.

But what is the right kind of advertising? We can only judge by results. Some things can be learned, however, by observing the methods of others, and considering suggestions that seem to meet the present situation.

No new cooking methods to learn when you Cook with GAS!
THE LOVELY bride can cook "like mother used to" when she uses a gas range—the handy short-cut to happy hearts and contented appetites.
Gas heat is even, dependable, constant heat. You need not learn new heat adjustments when you cook with gas. You can trust a maid with a gas range and you know your meal will be perfect.
Every home needs a modern gas range! Come in and see the many new models on display.
The Blue Star Seal is a symbol of quality identifying all gas appliances meeting the high standard of performance set by United States Government Bureaus and the testing laboratories of the American Gas Association. The entire gas industry stands behind this emblem of efficiency, durability and safety. It's your guarantee of good service and complete satisfaction.
NORTHERN INDIANA PUBLIC SERVICE COMPANY
YOU CAN DO IT BETTER WITH GAS

In the first place, it is quite evident that the problem calls for long-range educational forms of advertising. Price advertising, quick-sale campaigns, etc., are clearly out of order; they may even do more harm than good. One of the things to remember is that most of the conveniences claimed for electric cooking today were actually originated by the gas industry many years ago. There is a real danger that, through advertising, our friendly competitors will acquire all of the credit for introducing these new innovations which stir the enthusiasm of homemakers; and that the gas industry—the real pioneer—will be regarded merely as an imitator hurrying to catch the vogue of modernity by the fringe.

Thus we see leading advertisers in the gas industry putting their best foot forward by featuring the All-Automatic Gas Range, in some cases including even the clock control. Perhaps not many of these ranges will be sold at first owing to the higher price or some other natural hesitancy. The cost of merchandising the appliances must be charged to education. The demand will come later. The task of the moment is to show the public, in a substantial way, that, as one advertisement phrases it, "A modern gas range has everything a woman could wish, plus the speed, economy, and dependability of clean Gas Heat." This same company in another advertisement reminds the woman who has been reading about up-to-date housekeeping methods in the newspapers and magazines that "When you say 'Automatic Cooking' you are talking about the MODERN GAS RANGE."

Some advertisements go into quite considerable detail regarding the various features of modern gas cookery. More than one-third of the entire space may be taken up by such an attention-getting headline as this: "The Modern Gas Range is . . . Self-Starting . . . Self-Stopping . . . Self-Cooking . . . Self-Sufficient." If you can get over this idea to any substantial number of your readers, you can forget about the rest of your copy. Long descriptions are superfluous in such a campaign. This is one case where a good slogan is better than reams of descriptive "selling" copy. The object is simply to get over a thought and the copy should be stripped down to accomplish that one purpose—and no more.

"The World's Speediest Cooking Service" has been used for several years to establish one of the natural advantages of gas service for cooking. It can be used effectively in connection with present requirements. A rather striking advertisement draws attention with the

Gas, Madam, will never be out-moded so long as there is a Gas Range like this!
A NEW SUPER-RANGE OF EXQUISITE BEAUTY NOW GRACES COUNTLESS LOVELY DETROIT KITCHENS . . .
THIS MOST MODERN OF ALL MODERN RANGES
$94.75
$5 DOWN AND 18 MONTHS TO PAY, WITH SMALL CARRYING CHARGE ADDED. $10.00 ALLOWANCE FOR YOUR OLD RANGE UNTIL JANUARY 1, 1931
The Proof of the Baking is in the Results.
YOU CAN COOK FASTER AND BETTER WITH GAS
THE UNIVERSAL FUEL—MUCH MORE ECONOMICALLY THAN WITH ANY OTHER MODERN METHOD OF COOKING
DETROIT CITY GAS COMPANY

terse statement, "There is no more modern way to cook than with GAS."

The atmosphere of modernity is decidedly the thing that is needed in most gas range advertising today. Appliance manufacturers have gone to great lengths in introducing the best modern design into their equipment; but you would never guess it from glancing at much of the gas company advertising. Modish figures are essential where figures of any kind are used. The typography and lay-out should be up-to-date, even to the point of being "modernistic" if good taste is used. A number of special art techniques are also available in illustrating the range itself. When all of these elements are properly combined, there is genuine punch behind such a message as—"Gas, Madam, will never be out-moded so long as there is a Gas Range like this!"

It is amazing how little advertising has been done along these lines. Some time ago one company came out with the question—"Did you ever wonder why 15 Million Women Cook with Gas?" Dozens of other companies copied the headline, and then reverted to previous copy themes. Undoubtedly, the thought was interesting and worth using. It could not be considered a complete campaign in itself, however, for the thought inevitably arises—"Maybe they are looking for something better." The theme should have been developed into a series of advertisements showing how modern gas appliances, using the same dependable gas service that women have always known, have introduced new conveniences only slightly less radical and attractive than the discovery of gas for cooking itself.

The story has endless ramifications. On the subject of oven insulation alone, there is the basis for a summer campaign that would serve not only to modernize the kitchen through the installation of new appliances, but would also achieve a noticeable effect on the summer cooking load. Women will be doubly interested if you can show them how they can continue to serve full course meals to the family without wilting over a space heater disguised as a cook stove. When you talk about the insulation and cool kitchens, however, be sure you know what you are saying. Be sure that the appliances that your company is selling are really sufficiently insulated to live up to the claims of your advertising.

The mechanical conveniences of the modern gas ranges will go a long way to establish gas as the modern cooking fuel, provided they are properly advertised. In addition, however, gas itself needs some advertising, especially in relation to this subject of cooking. Some of the ads in the A.G.A. Copy Service have attempted to cover this point, two in particular being worthy of mention. "Ask any scientist which is the best cooking fuel!" was the headline of a two-column advertisement that, besides reiterating the statement about the fifteen million housewives who cook with gas, pointed out that every scientific laboratory, however elaborate and intricate, always has a gas burner somewhere on the work bench. The inference, of course, is that the laboratory scientist "always uses the one fuel that adapts itself best to every heating purpose."

Another advertisement from the Copy Service that fits extremely well into this picture carried the questioning headline: "What's all this talk about modern gas ranges?" The illustration, in chatty magazine-story style, showed a trio of women talking over their household experiences. A few years ago we might have said there was something forced about making a gas range the topic of the day. Now it only shows how the kitchen has graduated into society. There is no reason today—if, indeed, there ever was—why we should become apologetic when trying to sell kitchen equipment. In 1932 women are not ashamed to admit that they do their own housework. The result is that necessity has become fashionable; and your advertising can go just as far as it likes in striking the note of sophistication. Others will, if you don't.

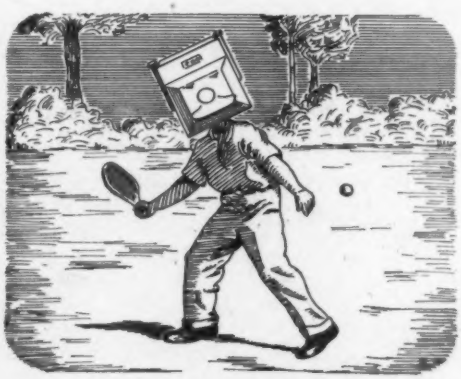
There remains the question of policy: How far shall we go in taking notice of, and offering comparisons with, our competitors? A combination company will probably look on the matter differently from one whose investment is entirely in gas operations. At any rate, a suggestion is offered by a middle western company, which published an advertisement directed at the new homemaker or young bride, faced with the double problem of selecting the best equipment and learning to cook. It is an argument frequently overlooked when talking about gas, but nevertheless effective when properly handled. The message was—

"NO NEW COOKING METHODS TO LEARN WHEN YOU COOK WITH GAS!"

1932 Bureau of Standards Yearbook

The increasing importance placed upon standardization by many foreign governments and world-wide developments along this line, as well as various other scientific achievements, are discussed in "The 1932 Standards Year book," published by the Commerce Departments' Bureau of Standards. Considerable detail is given on standardization work being done in the United States. Copies of Standards Yearbook may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for $1 each.

AMERICAN GAS MERCHANDISING ALMANACK



August

1932

AUGUST bring flies and other insects and thus a reason for the home manager to purchase an incinerator. August days also call for much hot water for cleaning, bathing, shaving, etc. Like all other months August is a good month to sell automatic hot water service for the man who will ask folks to buy.

August brings a profusion of fresh fruits and vegetables. August is a month when the home-manager thinks of "puttin' up" a few things for winter. Here enters the modern gas range.

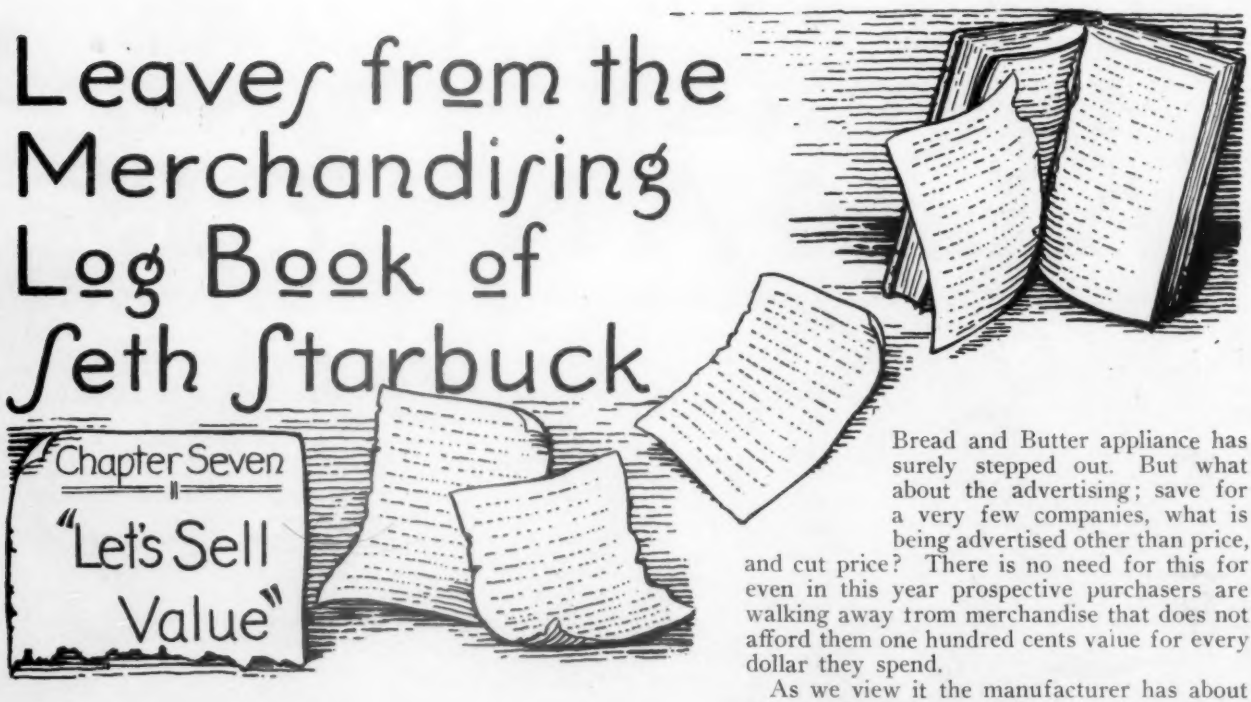
August window display advertising should employ cool colors and may well stress the theme, THRIFT—canning of fruits and vegetables, displaying a modern insulated, oven-controlled GAS range. Health may be the appeal in connection with a carefree gas water heater window. Health may also be used in setting up an incinerator display. Saving of time may be the theme when talking about the home laundry and the press-ironer. Where the ironer is a feature it should be sold on the basis of easy operation. Do not give the woman the impression that only an "expert" can operate it. Teach your salespeople how simple it is to operate and instruct them NEVER to operate it for a prospective purchaser, but to show her how easy she may operate it.

Keep away from "Cut Price" in all of your sales promotion work. Sell the VALUE of your merchandise and service; tell your customers how much they get, if it seems advisable, but keep telling them that they are getting 100 cents value for every dollar they lay out for gas appliances of modern design.

In building your displays and advertising make your statements POSITIVE, say gas is efficient, gas ranges are modern, gas cooking is clean. Omit the "est"—and ask folks to BUY.

1—Mon.	**Have all details of the month's activity before you on your desk; check each item and see that all is to function as planned.**
2—Tues.	**Run newspaper advertisement featuring "Thrift or Canning Sale."** Germany invaded Belgium, 1914.
3—Wed.	Columbus began his first voyage, 1492. He took a chance. **Gas men who GO AFTER BUSINESS take no chance.**
4—Thur.	Harry Lauder, comedian, born, 1870. **It's comical how some men expect to revive range sales by just sittin'.**
5—Fri.	**Conduct a Canning Demonstration in your store.** Mayor of Philadelphia signed contract between city and Philadelphia Gas Improvement Company under which city is to be partially supplied with gas—3,000,000 cu. ft. per day, 1888.
6—Sat.	**Re-arrange sales floor.** Gertrude Ederle swam English Channel, 1926.
7—Sun.	Work was started on erection of new gas house for Bath, Maine, 1918.
8—Mon.	First locomotive run in U. S., 1829. **Re-check details of your plan and check results to date.**
9—Tues.	Izaak Walton, "The Angler," born, 1593. **Run newspaper advertisement and feature story. "Canning for Thrift."**
10—Wed.	President Hoover's birthday; born, 1874. **Mail special offer to prospects developed during activity.**
11—Thur.	Fulton's steamboat made first trial trip, 1807. **Conduct store demonstration.**
12—Fri.	George IV, English king, born, 1762.
13—Sat.	General Merritt took Manila, 1898. **Change window display advertising.**
14—Sun.	Ernest T. Seton, naturalist born, 1860.
15—Mon.	**Re-arrange sales floor.**
16—Tues.	Battle of Bennington, 1777. **Run newspaper advertisement.**
17—Wed.	**Use phone to further interest prospects developed during the activity.**
18—Thur.	First iron smelted by electricity, 1909. **Watch your commercial load, gas men; the electric industry has recently launched a campaign to secure small heating jobs.**
19—Fri.	U. S. Constitution captured Guerriere, 1812. **Conduct Canning demonstration in store.** Mutual Aid Association of the New York and Richmond Gas Company, Staten Island, held annual summer festival at Happyland, South Beach, 1909; Wm. J. Welsh president of Association.
20—Sat.	Benjamin Harrison, president, born, 1833 **Change window display advertisements.**
21—Sun.	Beginning of Washington's march to Virginia, 1781. **Begin your march on users of antiquated gas ranges tomorrow.**
22—Mon.	U. S. International Cup Race, 1851. **Use 'phone to invite customers to store demonstration.** Arthur Hewitt read paper, "The Calorific Standard for Town Gas," before Canadian Gas Association Convention, 1918.
23—Tues.	**Run newspaper advertisement.**
24—Wed.	New U. S. Capitol Building started, 1818.
25—Thur.	Washington burned by British, 1814. **Conduct store demonstration.**
26—Fri.	First practical typewriter patented, 1843.
27—Sat.	**Put up cards in store announcing end of special activity.**
28—Sun.	Johann Wolfgang Von Goethe, poet, born, 1749.
29—Mon.	**Check-up on all prospects that have not been closed and endeavor to close them.**
30—Tues.	First food inspection act, 1890. **Run final newspaper advertisement.**
31—Wed.	**Check over your plans for September activities.**

Leaves from the Merchandising Log Book of Seth Starbuck



AS a regular dish we do not recommend dividing sales efforts but in trying times we do suggest that it may be done, especially in a so-called lean month. August, more than any month of the year, finds a general let-down in human activities. In times past there has been a feeling that, "it's not much use to expect any appreciable amount of business during the month. Most people are away on vacations, returning from an early one or making ready to go on a delayed one." This is true in a measure of a proportion of our populace, however there always remains at home a quota that provides pretty good business for the salesman who will devote about four hours of his day to asking them to buy.

August, 1932, will find many folks vacationing, but, he who still-hunts will find a-plenty of stay-at-homes. These stay-at-homes are buyers, folks who will buy if approached with the "your-dollar-never-before-could-buy-so-much-value," appeal.

WE who sell gas appliances are appreciative of the fact that we can give our customers greater value today than ever before in the history of the industry. Ranges, water heaters, clothes dryers, press-ironers, refrigerators and incinerators are all (those bearing the American Gas Association seal of approval) very much more efficient, economical and good-looking than ever before. We know this, but few of our customers do, due to the general tendency to let down on advertising and sales promotion in slack times.

Take for example the modern gas range—what an item to talk about; oven regulation and insulation, new high-speed burners, new models, new color combinations, better processed enamel, better built ranges, automatic lighters and controls, more compact models; the Bread and Butter appliance has surely stepped out. But what about the advertising; save for a very few companies, what is being advertised other than price, and cut price? There is no need for this for even in this year prospective purchasers are walking away from merchandise that does not afford them one hundred cents value for every dollar they spend.

As we view it the manufacturer has about reached the limit on wholesale prices and it is squarely up to us gas men to mark-up our appliances in a manner that will enable us to secure a ten per cent net and go out after business in a regular way.

If you will check over your successful sales of any appliance you will find that they were the appliances that you promoted hardest, ADVERTISED and talked about to people. If you want to keep your range business, or build your water heating business, your home laundry business or any other business, you must promote it.

Don't worry about the big promotion efforts the electric range folks are making, give your thoughts and time to the good old gas range, the choice of the fifteen million home managers. Look it over; think what that modern range brings to you and your customers—quick, clean, cool, economical cookery, modern, automatic, beautiful, efficient, insulated ovens, new super-speed burners. What a reason to ask folks to buy!

WE should get squarely back of the national movement to keep the home gas fires burning, to keep the 15,000,000 women cooking with that carefree fuel and to convert other millions who live on our lines and spend their energies and oftimes spoil their food by employing other cooking appliances and fuels.

As an activity for August we are offering a few suggestions to promote the sale of this modern gas range, and while we think it highly important to promote the gas range during this month, we suggest that one other appliance also be featured as a companion to the range for the thrifty home.

August brings fruits and vegetables in abundance at prices that tempt the home manager to "put-up" a few for the winter days. Why not christen your activity a "Thrift Sale?" Your advertising might play-up "Thrift via Home Canning," employing the feature of the modern oven method. If you are going to use a trade-in feature let your offer read; "This Modern ——— GAS range Only $——, and your old stove during August."

If you have a dealer tie-up, undertake to secure their

Fifteen million women now cook with gas. The yearly gas range replacement business is said to be 10% of the ranges in use. This means that the industry's gas range replacement business alone is 1,500,000 per year. Let's sell them and keep folks cooking with gas—meanwhile, keeping our revenues and property values intact.

cooperation. Get them to make a like offer during the same period, also secure the interest of your local newspaper in canning, having your home service department supply them articles and recipes to be published the same day you run your advertisements. Use your windows, service cars, trucks and salesmen's cars to advertise the activity. Give it all the publicity you can; display your merchandise on the store floor; use inserts in all envelopes leaving your store; have floor sales people approach all comers "to show them the Modern Gas Range."

Have your home service department conduct demonstrations on the sales floor; arrange with local grocers and hardware dealers who do not sell ranges to permit you to build a display in their windows that features, along with one of your ranges, the wares they sell, such as canning supplies, jars, pans, sealing wax, jar rubbers, paraffin, fruits and vegetables. In short, get everybody you possibly can to thinking and talking about canning and modern gas ranges.

WE have heard of two such cooperative activities that were highly successful; one of them was planned in connection with the sale of automatic storage water heaters while the other was conducted by a dealer handling mechanical refrigeration. The company staging the gas water heater activity enlisted the cooperation of a druggist, a grocery store, a men's furnishings dealer and a hardware merchant. Each of these local retailers permitted the gas company to display a water heater in their windows together with some item of merchandise that they sold and which depended upon hot water for its most successful use. These merchants also gave all customers an entry blank (provided by the gas company) which permitted them to enter a contest the gas company was conducting in connection with the activity. The gas company ran newspaper advertising each day featuring the contest and saying that entry blanks might be had from the cooperating dealers.

The refrigerator dealer interested the cooperation of a chain of food stores and a number of independent dealers. This plan featured food savings and the mechanical refrigerator as the means to that end. Salesmen and demonstrators were on hand in each of the food and other cooperating stores to explain how the mechanical refrigerator enabled the housewife to make savings by purchasing in quantity and by taking advantage of "specials" and keeping them in her refrigerator. The demonstrators also instructed customers visiting the stores how to build new menus and how to prepare many new and appetizing items, using foods sold by the dealer.

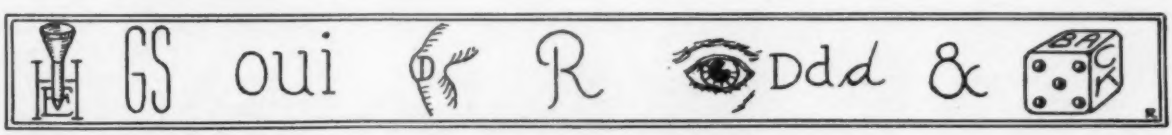
If you should decide to conduct a food demonstration or to secure the cooperation of chain stores it would be well to contact national headquarters at once, for it is our understanding that it is there that all such plans must be approved.

ALL cooperative plans should provide ways of giving the cooperative agencies free publicity and all advertising should carry their names. The gas man should also bear the full expense of special demonstrators, window displays announcements and other items incidental to such a plan.

Our suggestion would be to use: 1—Newspaper advertising to announce the plan; 2—Special window displays where possible; 3—out-side store banners where permission may be secured. The company should provide these things and see that they are used. Do not depend on the cooperating agency to do any work for you. In the first place, it is not right that he should and in the second, your results will be far more productive if you handle them yourself.

In conducting a contest do not ask too many questions of the contestant; be very certain to select disinterested, unbiased, competent judges; be very careful to print the requirements of the contest in a manner that everyone may fully understand. Do not extend your contest and be sure to cash-in on it by advertising that an exhibit will be made of entries in your store window.

Remodel some of the ideas we have taken from our note book; stage an activity in August, one that compels your sales-force to ASK FOLKS TO BUY.



Starbuch's Rebus—Answer on page 46

"We Are On the Way Back"

WE HAVE been passing through an era of specialization in business, in industry, in finance—but we are on the way back, if we have not already arrived, at the door of the old family doctor. Business, and particularly the utility industry has for the most part gone back to Main Street. For the next several years, at least, the responsibility for the growth of the gas industry is going to be very largely in the hands of the operating companies. To use a figure of speech we are going to be working "in our own back yards." The funds for extensions of service and other improvements are going to come to an increasing extent from the revenues and earnings of operating companies instead of from high pressure financial promotion. The voice of the operating company is going to have more weight in the formation of the policies of the industry than it has for quite some time. To a large degree our ability to make our work appreciated and ourselves felt in the future program of gas industry progress is going to depend very considerably on how fully every department of the operating company cooperates in the achievement of our major problems of increased service, increased net revenue and increased public respect. There is going to be small demand for specialists, for solo artists, unless they can blend their talents with those of every other one engaged in the business, for its improvement. In other words there is a need for more chorus-work, for more team-work, and those who realize this situation and direct their efforts to this end are going to find plenty to do and an increasing appreciation of their capabilities. *—Keith Clevenger before Domestic Gas Appliance Course and Home Service Conference, A.G.A. Laboratory, Cleveland, June 15-17, 1932.*

Canadian Gas Association Holds 25th Annual Convention

DEPRESSION or no depression nothing ever seems to interfere with the success of Canadian Gas Association Convention. The 25th annual meeting recently concluded in Winnipeg, Manitoba, on June 10th, was in every sense one of the most successful, enthusiastic and encouraging meetings ever held by that body. Distance did not appear to dampen the desire of members and friends from taking in this anniversary event, for many gas men from as far west as Vancouver, and as far east as Halifax, and many from the United States, were on hand to take part in the deliberations of June 9th and 10th, and as far as could be learned no one came away disappointed.

Hugh McNair, Manager Gas Utility, Winnipeg Electric Co., of Winnipeg, Manitoba, was re-elected president of the Association. Other officers include Donald G. Munroe, Vice-President and Managing Director, Montreal Coke & Mfg. Company, Montreal, elected the vice-president, with J. C. Dawson, Assistant Superintendent of the Gas Department, Quebec Power Co., Quebec City, as second vice-president. G. W. Allen, who for so many years has acted as Secretary-Treasurer, was re-elected to that office.

Members of the Executive Committee include: Arthur Hewitt, Toronto, Ontario; C. A. Jefferis, Toronto, Ontario; J. M. H. Young, London, Ontario; V. S. McIntyre, Kitchener, Ontario; H. S. Williams, Guelph, Ontario; J. J. Humphreys, Montreal, Quebec; J. S. Norris, Montreal, Quebec; D. R. Street, Ottawa, Ontario.

No decision has been arrived at regarding the time and place of the 1933 Convention. The expected arrival in Canada and the United States of many British gas engineers in the fall of 1933 had some bearing on the question whether it would be better to hold the 1933 meeting at the time of the arrival of the British engineers, or to hold the meeting in June as usual. This will most likely be settled at the executive committee meeting to be held this October.

The secretary-treasurer's report was extremely encouraging showing the Association to be in a good position financially. The secretary reported a substantial balance to the credit of organization. The Laboratory Approval Division also reflected a very favorable balance to next year.

The president's address covered the history of the Association during its 25 years' existence.

The Annual Banquet turned out to be a remarkably fine affair. Greetings were extended personally by Major Alexander Forward, as representing the A. G. A., while words of appreciation on the success of the Canadian organization were expressed by R. M. Conner, director testing laboratory, A. G. A., who was also present. Arthur H. Lymn, M. I. Chem., E., F. Inst. F., of London, England, brought greetings and best wishes from the British Society of Gas Industries. A number of other prominent men connected with the gas industry were also present and voiced their hearty appreciation of the success of this 25th Anniversary meeting.

Eleven splendid papers, reflecting the high character of the association's endeavors in this connection, were presented at the business sessions, some of the more outstanding and timely papers were as follows:

"The Carbonization of Coal with Electricity," by H. S. Walker, Engineer, the Research Department, The Detroit Edison Company, Detroit, Mich.

"A New Development in the Waterless Type of Gas Holder," by John L. Murray, Gas Engineer, Cumberland County Power & Light Co., Biddeford, Maine.

"The Use of Gas for the Ignition of Oil and Coal Fuels," by Roy Soderlind, Combustion Engineer, Ottawa Gas Company, Ottawa, Ontario.

"Making Calcium Carbide and Acetylene in Large Quantities at Shawinigan Falls, Que.," by E. R. Williams, Supt. Carbide Div., and A. E. Lawton, Engineer Carbide Div., Shawinigan Chemicals, Limited, Shawinigan Falls, Que.

"Gas Leaks, and Supporting Gas Mains Over Cuts," by D. O. Wing, Asst. Supt. Marine and Services Dept., Montreal Light, Heat & Power Con., Montreal, Que.

"Oxwelding and Lindewelding Recent Canadian Pipe Lines," by D. S. Lloyd, Service Engineer, Dominion Oxygen Co., Ltd., Toronto, Ontario.

The ladies of the party were very well entertained by the Winnipeg Electric Company at the Lower Fort Garry Country Club, and were also given a sight-seeing trip of the city.

Mr. Edward Anderson, K. C., President and General Manager of the Winnipeg Electric Company gave a luncheon at the Manitoba Club to a number of the distinguished guests of the Association.

EQUIPMENT NEWS

New Air Conditioning Equipment

The L. J. Mueller Furnace Company, Milwaukee, Wisconsin, has just announced the addition of the CLIMATOR "III" to their line of air conditioning

Climator "III"

equipment. This unit consists of a combination of fan, air washer and filters, enclosed in a single, compact casing, suitable for use with any type warm air furnace, with either new installations or for addition to existing gravity jobs, to provide complete air conditioning facilities.

Climator "III" has been designed to meet the need for a complete unit which can be quickly and easily installed, and of such dimensions that it may be taken in through a 2'6" door.

A large diameter fan, of improved design, has secured performance which permits the use of efficient filters and washer, and the connection of complete recirculating ducts. The fan delivers the requisite volume of air against the resistance necessary to secure an efficient balanced installation.

Illustrated and descriptive literature will be mailed on request.

New Automatic Control Device

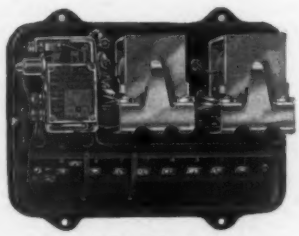
The Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., announce a new device in the automatic control field which provides instant protection against the escape of unburned gas in the event of flame or pilot failure. It may be used in place of the customary combustion or pilot safety device, but its outstanding characteristic is its ability to handle installations where conventional controls are inadequate.

This new system, called the Protectoglow, is entirely electric and without moving parts. It is not dependent upon temperature and is absolutely reliable. The heart of the device is the Protectoglow tube, which acts as an electrical relay and is capable of operating at the command of an exceedingly minute electric current

passed through the flame itself. Should the flame fail, the circuit through the flame is broken, instantly shutting off the gas flow. In the absence of pilot flame, the Protectoglow will not allow the burner to start.

The Glo-Relay is used in conjunction

The Protectoglow



The Glo-Relay

with the Protectoglow and serves to operate the valves or motor of the burner at the command of the thermostat, control switch, or Protectoglow. It is self-contained and is available for either constant or intermittent ignition burners.

New Oxweld Regulators

The Linde Air Products Company, 30 East 42nd Street, New York, N. Y., has recently added two new regulators, the Oxweld Type R-48 Oxygen Regulator and the Oxweld Type R-49 Acetylene Regulator to its line of Oxweld welding and cutting apparatus. These new regulators have been designed to provide the Oxweld line of apparatus with a pair of

Oxweld Type R-48 Oxygen Regulator

lighter duty regulators, particularly for use with the Oxweld Type W-15 Welding Blowpipe in the Oxweld Sheet Metal Welding Outfit.

These new regulators of the sturdy stem type are the most compact yet designed. The bonnet is held in place by a forged brass cap ring which assures a non-leaking diaphragm. Assembly and disassembly are facilitated by the ribbed cap ring which assures an easy grip.

The Monel metal stem is similar to that used in other Oxweld regulators. It is detached from the diaphragm thus providing increased smoothness in the operation of the regulating mechanism. The diaphragm is made of the same rubber composition material used in other Oxweld regulators and the springs are made of cadmium-plated steel. Pressure forgings are used in the body cap ring and pressure adjusting screw. This screw has a high thread pitch which permits rapid pressure adjustment.

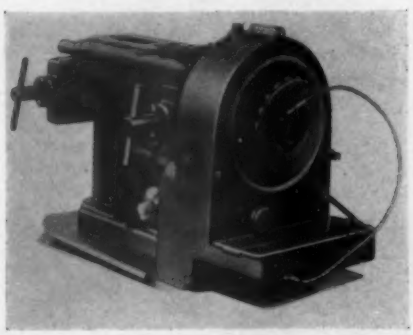
A new type of safety release is incorporated in the Oxweld Type R-48 Oxygen Regulator.

Oxweld Type R-49 Acetylene Regulator

The hose connection on the Oxweld Type R-48 Oxygen Regulator is for ¼-in. oxygen hose, and on the Oxweld Type R-49 Acetylene Regulator is for ⅜-in. acetylene hose. Other size hose connections can be supplied, if required.

New Portable Pipe Threading Machine

The Axelson Manufacturing Co., Los Angeles, Calif., has placed on the market the Axelson Portable Pipe Threader. This machine is portable, weighing less than 190 lbs., consumes little power and oper-



ates rapidly. It attaches to any standard light socket, is powered by a reversible motor, and may be used on any 110-volt circuit. The threader will handle pipe in all sizes from ½" to 2". Bolt threading dies may also be used although they are not furnished as standard equipment. As an indication of the speed with which this threader operates, it is claimed that 2" pipe may be cut, reamed and threaded complete in less than 2½ minutes, with other sizes faster in proportion. The operating principles of the machine are a standard square die being revolved on the pipe rather than revolving a length of pipe through a die head. This principle not only ensures a straight thread, but enables the operator to run thread on long pipe stands. It has automatic feed, cutter head or reamer can be quickly installed in place of threading die, oil pump lubrication, automatic self-centering jaw chucks, speed and economy of operation.

Electric Temperature Signal

Uehling Instrument Co., Paterson, N. J., announce a temperature signal device for determining temperature by means of electric lights and known as the Thermo-

Tel. The instrument, as illustrated, consists of different colored electric lights, actuated by changes in temperature. When the temperature is within the limits for which the instrument is set, a white light will illuminate, when the temperature is above the limits, a red light will illuminate, and when the temperature is below the limits, all lights will be out. Each Thermo-Tel signal is set for the particular limits desired, for example, 190° and 193°. A glance at the colored lights will definitely determine whether the temperature is high, low, or within said predetermined limits. If desired, the signaling lights may be located at any dis-

(Continued on page 48)

NEWS of the GAS INDUSTRY

Gas from Jackson Field, Mississippi

The Jackson gas field, adjacent to the city of Jackson, Miss., is described in a report recently issued by the United States Geological Survey. The bringing in of the first gas well in this field in February, 1930, was followed by intensive drilling, and within the next year 42 gas wells had been completed with a total daily open-flow capacity of over 1,250,000,000 cubic feet of gas. Gas from the field is distributed by the United Gas Public Service Co., the Mississippi Power & Light Co., and the Mississippi Industrial Gas Co., and the output of two wells is consumed by the Gulf States Creosoting Co. The gas has a high heating value and contains a large percentage of methane. It is produced from a Cretaceous chalk 2,088 to 2,236 feet below sea level, in three separate areas where the chalk and the overlying rocks have been upwarped into domes or anticlines.

Approve Mixed Gas Rates

New rates, effective October 1, for mixed natural and artificial gas used by customers of the Syracuse Lighting Company in Syracuse and adjacent communities were approved recently by the Public Service Commission, which said the schedules would save about $480,000 for consumers.

A sixteen-mile pipe line, soon to be completed, will supply the mixed gas. The rates will be expressed in both therms and cubic feet, and the company will be required to bill consumers on both bases. It sought permission to bill only on the therm basis, which is in use in England and has been adopted recently in some States of the Union.

Companies controlled by the Standard Oil Company of New Jersey and the Columbia Gas and Electric Company have made plans for developing a natural gas production and distribution in Central New York, but it was said they had been ready to abandon them if therm billing met rejection entirely.

Reproduction Value of Lone Star Gas Company Fixed at 47 Millions

United States Daily reports from Austin, Texas, that reproduction value of the Texas properties of the Lone Star Gas Company has been fixed at $47,355,114 in a report made under the direction of the State Railroad Commission.

The valuation, which was authorized by the 1931 Legislature, was made at a cost of approximately $50,000, the report shows, and was made as the basis for considering the cost of gas in passing upon rates in numerous cities to which the company sells natural gas at wholesale.

The report said that the company's books show a present reproduction cost of the properties in Texas and Oklahoma to be $72,182,299. An accompanying audit showed earnings of $5,699,316 in 1930 and $4,910,000 in 1931, excluding depreciation, depletion, interest, income taxes, etc.

Sale by the Lone Star Company of domestic gas decreased from 17,974,266,500 cubic feet in 1930 to 17,023,686,700 cubic feet in 1931, the report showed, and of industrial gas, from 22,942,507,500 in 1930 to 17,604,333,100 in 1931.

Pipe Line Franchise to Cross Country Roads Held Unnecessary in Maryland

The Court of Appeals of Maryland in the case of West v. Maryland Gas Transmission Corporation decided:

"That where the gas company constructed a line through certain counties for the purpose of transmitting natural gas to be sold to local distributing companies and had secured deeds from the owners of the land abutting on each of the public roads under which the pipe lines crossed, no franchise from the county authorities was needed as there is no law which requires the obtaining of such a franchise from the county authorities for the sole purpose of crossing under the road with pipes; the County Commissioners have only such right under the bed of the road in the open country as entitles them to maintain the public easement of way, with the incidents legally attached thereto, and the use of the subsurface not being incidental to the maintenance of the way, but remaining the property of the owner of the fee, the County Commissioners possess nothing which they can grant or refuse to grant, and no franchise is necessary."

The Court points out the distinction between what the public acquires by an easement of way in a city street and that which it acquires by a right of way in a country road.

Decrease in Philadelphia Company's Earnings

Net earnings of Philadelphia Company and Subsidiaries for the twelve months ended April 30, 1932, showed a decrease of 13.82 per cent, as compared with the previous twelve months. Gross earnings decreased 12.04 per cent.

Convention Calendar

August

24-26 Pacific Coast Gas Association, Hotel Del Monte, Del Monte, Calif.

25-26 Wisconsin Utilities Association Commercial Section Conference, Eau Claire Hotel, Eau Claire, Wis. John N. Cadby, executive secretary.

October

4-5 Indiana Gas Association, French Lick Hotel, French Lick, Ind. P. A. McLeod, Secretary-Treasurer.

10-14 American Gas Association, Atlantic City, N. J.

Northern States Power Company Shows Gain in Earnings

Net earnings of Northern States Power Company (Delaware) and Subsidiaries for the twelve months ended April 30, 1932, showed an increase of 3.53 per cent, as compared with the previous twelve months. Gross earnings increased .74 per cent.

American Gas Association Issues Valuable Text

American Gas Association has recently published "Combustion," a book which should receive widespread acceptance. This work contains 208 pages, 9 x 12, and is illustrated with 118 figures and charts.

The book starts off with a chapter dealing with a discussion of heat and its measurement, and then proceeds to take up such subjects as "Gas Volume and Pressure," "Chemistry of Combustion," "Thermal Capacity," "Heat Transfer," "Combustion Data of Commercial Gases," "Atmospheric Burners," "Industrial Combustion Equipment," "Temperature Control," "Gas Analysis," and "Fuel Comparisons." Various conversion tables, correction factors, etc., are to be found in the appendix.

Needless to say, the data and information have been drawn from the best sources available and are in every way authoritative. In the event the reader might care to delve further into the various phases treated a complete bibliography will be found at the end of each chapter.

Not only is this work neatly gotten up and very clear as to charts and illustrations, but will be found to contain information which many gas men can use daily in their various duties. Indeed, it is suspected that the text will find such frequent use that the publishers might consider reissuing it in its next edition with a cloth cover. Its price is $2.00 per copy, net, postage to be paid by the purchaser (shipping wt. 2½ lbs.). Special prices on orders over thirty copies. Order through American Gas Association, 420 Lexington Avenue, New York City.

(News continued on page 46)

FAVORED FOR DIFFICULT INSTALLATIONS

WHEN a particular make of pipe is entrusted so generally with the steady transmission of valuable gas across deep rivers, treacherous swamps, troublesome bayous and over rugged mountains, you can be sure that pipe line engineers have an extra measure of confidence in its ability to make good.

NATIONAL Pipe has won this greater confidence—through the years—by constantly and consistently proving its particular fitness for every kind of difficult pipe-laying condition. Both over land and under water . . . its great strength, uniformity and ductility have succeeded in meeting every requirement.

The superior qualities that have made NATIONAL the favored pipe for difficult installations and for outstanding long lines, also make it the ideal pipe for city distributing mains and service lines.

For safety, durability and economy, specify NATIONAL—

America's Preferred Gas Pipe

NATIONAL TUBE COMPANY · PITTSBURGH, PA.

Subsidiary of United States Steel Corporation

NATIONAL PIPE

New York Consolidated Accorded High Honor

The Certificate of Appreciation of the American Museum of Safety was presented to the Consolidated Gas Company of New York and its affiliated companies at a luncheon at the Union League Club on May 25, in recognition of the company's health, safety, and industrial welfare work among employees, customers, and the public.

The inscription on the Certificate is as follows:

"For accident prevention as related to employees, customers, and the public; for employee education, health, home ownership, savings, service annuities, and welfare in general—the highest standards of employee relationship have been created, making by precept and practice a most notable contribution to the industrial and social life of the nation."

Arthur Williams, President of the American Museum of Safety, presided, and presented the Certificate to George B. Cortelyou, President of the Consolidated Gas Company.

The following letter from President Hoover to Mr. Cortelyou was read at the luncheon:

"I am gratified to learn that the American Museum of Safety is to present its 'Certificate of Appreciation' to you, in recognition of one phase of your many outstanding services to the public since your entrance into private business twenty-one years ago. I have long held that the Federal Government evoked a type of socially-minded service of exceptional unselfishness and breadth of vision, and your distinguished record in Washington, followed by many achievements of like color in civil life, should be a stimulus to others as well as a profound satisfaction to yourself."

In presenting the Certificate to Mr. Cortelyou, Mr. Williams described the extent and scope of the welfare and safety work of the company, and praised Mr. Cortelyou's personal contributions to these activities.

Mr. Cortelyou stated that he greatly appreciated the honor conferred upon his company and he accepted it on behalf of "the splendid body of executives and workers."

Personals

Marcy L. Sperry has been elected President of the Washington Gas Light Company, Washington, D. C. Mr. Sperry, who is the son of Rear Admiral Charles S. Sperry, U. S. N., goes to Washington from the Fall River Gas Works Company, Fall River, Mass., where he has been Vice-President in Charge of Operations. He takes to the company a wide experience, having started in the public utility business directly after graduating from the Massachusetts Institute of Technology in 1900. Shortly after leaving the Institute he associated himself with Stone & Webster at Savannah, Ga. After managing the Ponce Electric Company at Ponce, Porto Rico, he was called to be General Superintendent in charge of the operating and construction organizations of the Minneapolis Electric Company. When this work was well in hand he returned to Georgia as Manager of the Savannah Electric Company. From Savannah Mr. Sperry went to New England, with headquarters in Boston, where for several years he has had active supervision of the operations of a number of gas and electric companies.

L. D. Romig has been appointed by the Board of Directors to the office of Treasurer of the Southern California Gas Company, Los Angeles, California, succeeding W. E. Robbins, deceased.

Mr. Romig entered the employ of the Company in October, 1922, and has successively held the positions of Chief Statistical Clerk, Tax Accountant, and Assistant Treasurer.

W. J. Hightower was recently elected treasurer of the Charleston Group of the Columbia Gas & Electric Corp. Mr. Hightower was formerly assistant treasurer.

W. K. Holleron has been appointed manager of the San Marcos and Buda, Texas, divisions of the United Gas Utilities, Inc.

T. W. Engle, for 34 years superintendent of the Grafton District of the Pittsburgh & West Virginia Gas Company, recently retired from service.

E. A. Stowe was recently appointed District Agent of the Southern California Gas Company at Banning, California. For the past year Mr. Stowe has been Chief Clerk in the San Bernardino office.

John F. Conroy has been appointed sales manager of the Milford, Mass., Gas and Electric Company.

H. D. Lehman has been appointed Superintendent of the newly formed Customers Service Division of the Philadelphia Gas Works Company. This division will handle installation and removal of all appliances, servicing of all appliances, gas supply inspection work, installation, inspection and removal of meters.

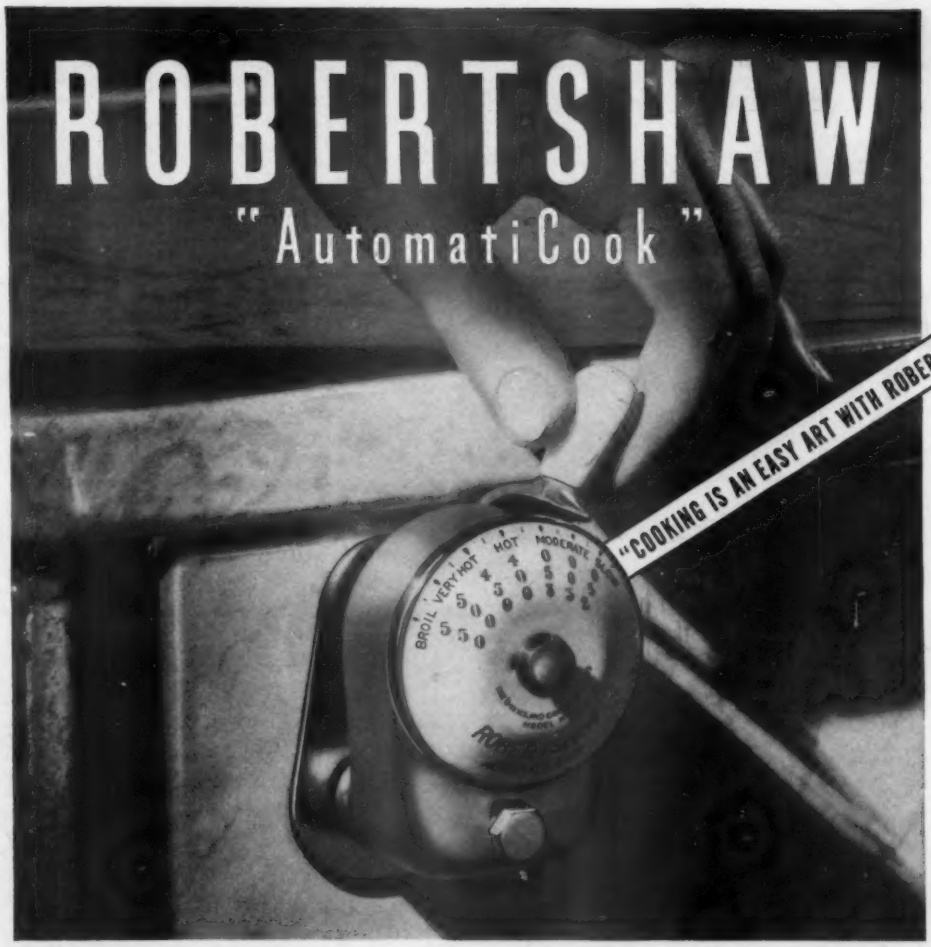
T. V. Flynn has been appointed superintendent of the Street Division of the Philadelphia Gas Works Company. This division was recently formed to take charge of installation, maintenance and renewals of mains and services, and work incidental thereto.

Henry C. Cummins was recently elected a member of the executive committee of the board of directors of the Standard Gas and Electric Company, succeeding the late Halford Erickson.

Elbert H. Sykes, former supervisor of merchandise sales of the Northern Indiana Public Service Company, South Bend, has been transferred to the Interstate Public Service Company, Goshen, Ind., where he will have charge of sales research work.

Stanley Moore was recently appointed manager of the Lexington and Thomasville Divisions of the North Carolina Gas Company.

Answer to Starbuck's Rebus:—
"The things we need are ideas and backbone."



MODEL "K"
FOR CONSOLE RANGES

The ROBERTSHAW

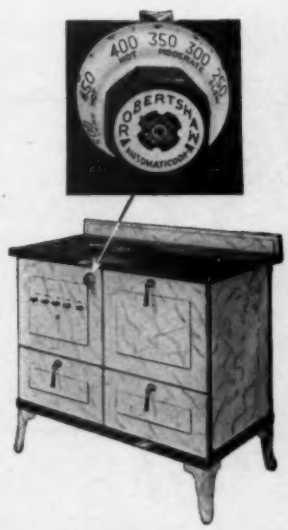
is Your Best Range Salesman . . .

This year, you are able to offer your trade the greatest range values in history.

But don't forget that value is a word that means much more than price.

And value . . . in a gas range . . . is a matter of *performance* just as much as appearance . . . which means, above all else, *correct oven control.*

That is why the Robertshaw is such a good salesman for you . . . your customer knows that it assures her receiving the last word in accurate, dependable, trouble-free performance. And that's a BIG point to remember, whenever you order ranges this year.



MODEL "F"
FOR TABLE TOP AND CONSOLE RANGES

ROBERTSHAW THERMOSTAT CO.
YOUNGWOOD, PA.

TRADE NEWS

Semet-Solvay Engineering Corp. Contracts

The Empire Gas & Electric Company, Geneva, N. Y., has contracted for equipment to replace and modernize certain portions of its ammonia distillation apparatus.

The New York and Richmond Gas Company, Staten Island, N. Y., has purchased 5,000 gal. capacity de-emulsifier. This equipment will be used to dehydrate tar emulsion. The installation includes a treatment and a solution tank and the necessary piping.

This company also has contracted for an extension to its oxide purification unit, adding one box, with manifold and bottom dump doors.

The Detroit Mich. City Gas Company has placed orders for several equipment items required on various plants. The material includes four 30″ hydraulically operated superheater stack valves, and backrun piping.

The New Haven, Conn., Gas Light Company has purchased for its plant a number of 30″ Semet-Solvay gate valves.

A complete tar burning unit is being installed for the Pittsfield Coal Gas Co., enabling the plant to make steam from its surplus tar, thus displacing steam coal. The contract includes a tar burner, tar heater, steam and tar piping, insulation, brickwork, changes to boilers and erection. The company's construction work also includes a 65-foot steel stack for the Semet-Solvay waste heat boiler.

The Salem, Mass., Gas Light Company has ordered a multiple washer and a quantity of Semet-Solvay pipe and fittings.

A steadily increasing list of gas companies are installing the new design Semet-Solvay 8-point checkerbricks in their water gas carburetors and superheaters. Recent adoptions of this patented design of checker include the following companies: Florida Power and Light Company, Miami, for a 9′ machine; Hartford Gas Company, Hartford, Conn., for an 11′ machine; Rockville-Willimantic Lighting Company, Willimantic, Conn., for a 5′ machine.

Bulletin on Arc Welding Supplies

The Lincoln Electric Company, Cleveland, Ohio, manufacturers of "Linc-Weld" motors and "Stable-Arc" welders, have just published a new 24-page bulletin known as Section No. 3304, covering a complete line of Supplies for Arc Welding.

A full description with prices of electrode holders, cables, protective shields, protective lens, protective clothing and various supply parts is included as well as electrodes for all kinds of arc welding.

Among the new electrodes described is "Manganweld" for welding High Manganese Steel, "Aluminweld" for welding Aluminum and "Hardweld" for hard or abrasion resisting welds. Fleetweld, a shielded arc electrode for mild steel is also discussed.

The bulletin is for general distribution and copies may be secured from the Company at Cleveland, Ohio.

New R-C-W Bulletins

Roots - Connersville - Wilbraham, Connersville, Ind., have just issued two new bulletins Nos. 40-B10 and 170-B10. Bulletin 40-B10 is devoted to Connersville Rotary Displacement Meters and includes several installation views, along with a table of ratings, cross-sectional diagrams, etc. Bulletin No. 170-B10 illustrates and describes R-C-W Centrifugal Blowers and Compressors, which supplement their line of Centrifugal Pumps.

Copies of these bulletins can be obtained upon request.

New Acipco Pamphlet

The American Cast Iron Pipe Company, Birmingham, Ala., have issued a pamphlet outlining Acipco pipe joint progress in the transmission and distribution of gas. The various types of Acipco joints are described and illustrated, as well as Mono-Cast Doublex Simplex Pipe. Copies of this pamphlet can be obtained upon request.

Leaflet Describes Fulton Back Pressure Regulator

The Chaplin-Fulton Mfg. Company, Pittsburgh, Pa., have issued leaflet No. 2900 illustrating and describing The Fulton Back Pressure Regulator, with automatic cut-out latch. This leaflet also includes price list and list of parts of the regulator. Copies can be obtained upon request.

New American Radiator Catalog

An attractive catalog entitled "Ideal Heating for Cottage or Skyscraper" has just been issued by the American Radiator Company, 40 West 40th Street, New York City. This catalog covers their complete line of products and is fully illustrated.

H. V. Schiefer Joins C. O. Bartlett & Snow Co.

H. V. Schiefer, formerly with the R. H. Beaumont Co., is now associated with The C. O. Bartlett & Snow Co., of Cleveland, Ohio, in connection with the sale of fuel and ash handling equipment and bulk material handling systems. He will make his headquarters at the company's main offices in Cleveland.

Fisher Governor Co. Appoint Representatives

The Fisher Governor Co., Marshalltown, Ia., have recently established two new exclusive representatives. One is the Grinnel Company of Minneapolis, Minnesota, 240 Seventh Ave., South, and the other is the Steam Plant Equipment Company, 1012 N. Third St., Milwaukee, Wisconsin.

Bulletin on Expansion Joints

The Croll-Reynolds Engineering Co., Inc., 17 John Street, New York, have issued a new illustrated bulletin of eight pages describing in detail the "Flexo-Disc" packless expansion joint suitable for a variety of conditions including high temperature steam or corrosive fluids, available in sizes from 3″ to 30″, expansion element of alloy steel.

Data Issued on Mitchell Vibrating Screen

The Gifford Wood Co., C. W. Hunt Division, Hudson, N. Y., recently issued a report covering the performance of a Mitchell Electric Vibrating Screen handling cement clinker installed at a mill operated by a large cement company. The figures contained were obtained by means of hourly tests conducted during actual mill production by the engineers of the cement company concerned. The report contains explanation and results of tests, record of power consumption, report of inspection, charts, description of unit, photograph and sketches.

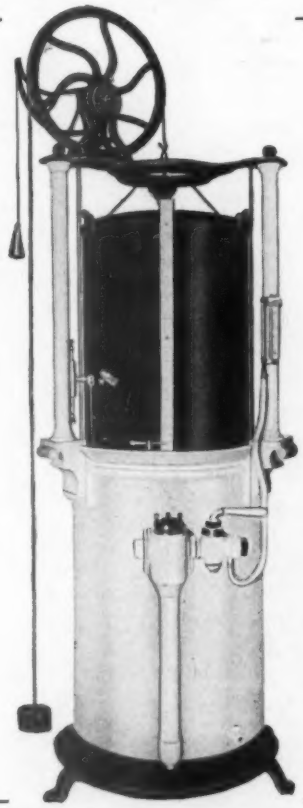
Electric Temperature Signal

(Continued from page 43)

tance from the temperature which is being observed. The signals are accurate to within less than one-tenth of one degree Fahrenheit, and can be read at a distance of two hundred feet or more. Its application is of interest in industrial gas operations.

SUPERIOR

Gas Meters
Provers
Service Cleaners
Diaphragms
Repairs



SUPERIOR
METER CO.
167-41st Street
Brooklyn, N. Y.

Indicating Installations of Coal Gas Generating Equipment Recently Completed by

IMPROVED EQUIPMENT—RUSSELL ENGINEERING CORPORATION

24 State Street, Engineers—Builders New York

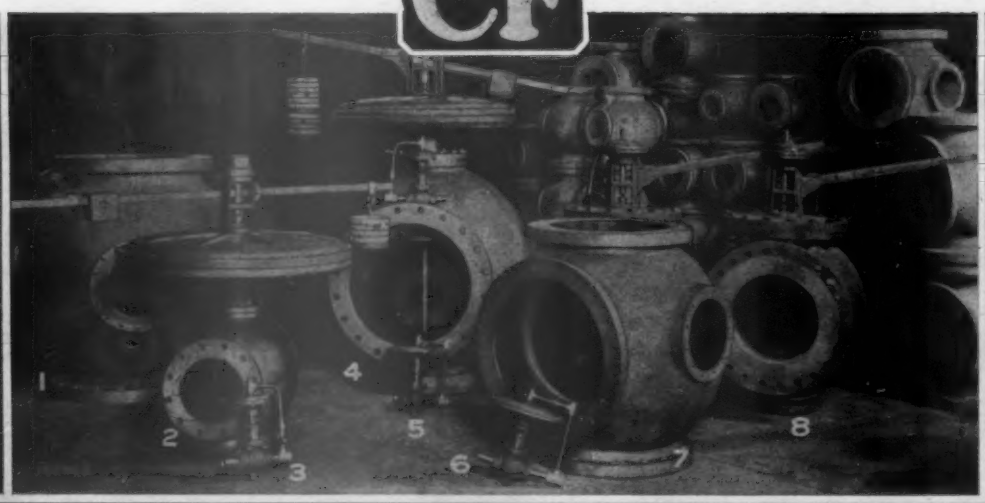
A FULL CF RANGE

1 BODY FOR TWENTY-FOUR-INCH LOW PRESSURE REGULATOR.

2 A TEN-INCH DIFFERENTIAL REGULATOR.

3 A THREE-FOURTHS INCH HIGH PRESSURE REGULATOR.

4 TWENTY-FOUR-INCH DIFFERENTIAL REGULATOR FOR MIXING GASES.



5 ONE-INCH HOUSE REGULATOR.

6 ONE AND ONE-HALF INCH HOUSE REGULATOR.

7 BODY OF A TWENTY-INCH WEIGHTED ILLUMINATING REGULATOR.

8 A SIXTEEN-INCH HIGH PRESSURE REGULATOR.

REGULATORS

Durability and accuracy to such a degree that they command admiration, maintained by unremitting efforts for over forty years, have made Fulton Regulators the standard bearers of quality wherever regulators are used on this continent and in many fields abroad. Varying types and sizes have been evolved to meet the growing and altering needs of modern gas control. The same ideals of design, materials and workmanship are embodied in all Chaplin-Fulton products. All are illustrated and described in printed matter, free on request.

The Chaplin-Fulton Mfg. Company

ORGANIZED 1884—OLDEST BUILDERS OF GAS REGULATORS IN THE COUNTRY. BUILT IN ALL SIZES FROM 1 INCH TO 24 INCHES; FOR ALL SERVICES 1 OZ. UP TO 2000 LBS. PRESSURE TO SQUARE INCH.

28-40 Penn Avenue Pittsburgh, Pa.

BAROMETERS

PHILADELPHIA, THE WORKSHOP OF THE WORLD

has 14,000 Manufacturing Establishments of which many have World-Wide Reputations.

"PRINCO" STANDARD FORTIN MERCURIAL BAROMETERS

are in World-Wide use because they, too, have a "World-Wide Reputation"

THEY ARE GOOD BAROMETERS
THEY ARE REASONABLE IN PRICE

For more than a decade they have been made in such manner that they can be shipped safely and successfully wherever there is a common carrier. This has been recognized as an achievement in Barometry.

PRECISION THERMOMETER & INSTRUMENT COMPANY

1439 BRANDYWINE STREET - - - - - PHILADELPHIA, PA.

Byllesby Engineering

and Management Corporation

Wholly-owned subsidiary of

Standard Gas and Electric Company

231 South La Salle Street, Chicago

New York Pittsburgh San Francisco

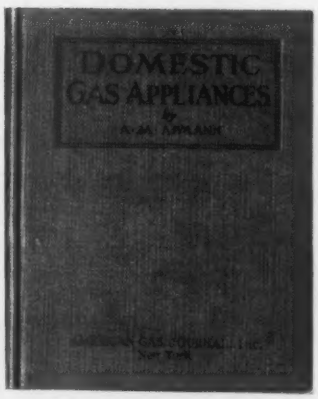
HEATING
BUNKER "C" OIL

for carburetting gas requires high pressure and high temperature.

ANDALE
BOWED TUBE
HEATERS

remain tight and are easily cleaned. These are the requirements for continuous satisfactory operation.

ANDALE COMPANY
1600 ARCH STREET
PHILADELPHIA



A Book
for
Every
GAS MAN'S
LIBRARY

PRICE
$2.50

This book presents first-hand facts and data, profusely illustrated, concerning every type of domestic appliance which uses gas as a fuel, and is of special interest to gas men interested in the sale of such appliances. Mr. Apmann has made an intensive study of gas utilization and therefore writes authoritatively on this subject.

AMERICAN GAS JOURNAL
53 Park Place, New York

IRON BORING
OXIDE

A REVELATION IN PURIFICATION!

G. P. M. IRON HYDROXIDE

A Result of Research

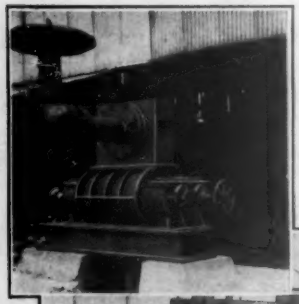
Greater Activity
Higher Capacity
Longer Life

GAS PURIFYING MATERIALS
COMPANY INC.

FOOT OF HALSEY STREET · LONG ISLAND CITY
· NEW YORK ·
BRANCH YARD—PROVIDENCE R.I.

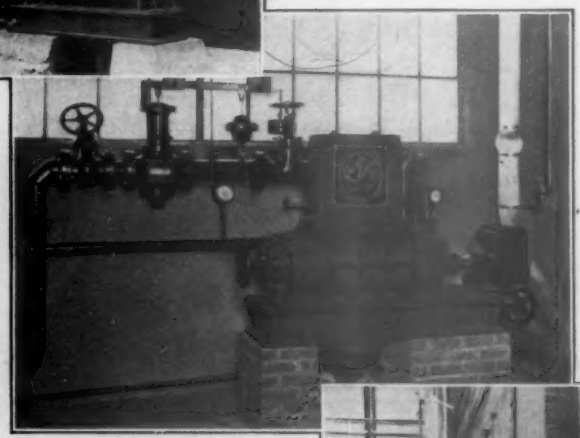
ACCURATE

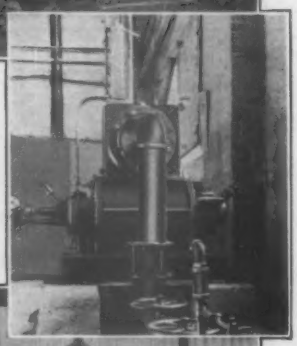
INDUSTRIAL METERS



Left—Connersville Meter measuring gas in a steel mill at Birmingham, Ala. Normal load is 20,000 to 40,000 cu. ft. per hr.

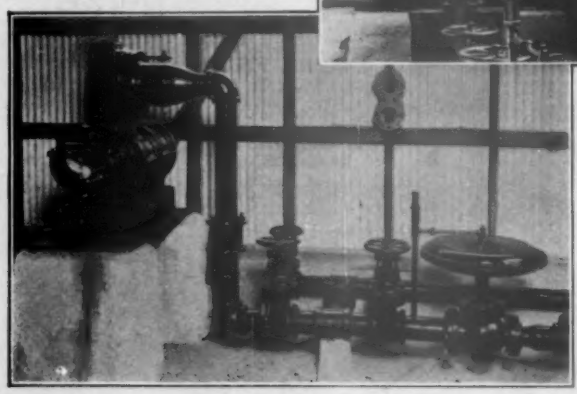
Below—Connersville Meter installed by the Consumers Power Co. to meter gas to the Motor Wheel Corp. at Lansing, Michigan.





Right—15,000 cu. ft. per hr. Connersville Meter measuring gas to boilers in the natural gas field of the Southwest.

Below—Connersville Meter registering the natural gas consumed under boilers of a laundry located at San Antonio, Texas.



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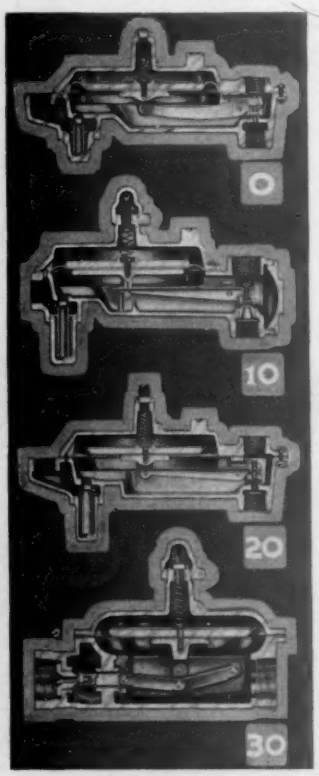

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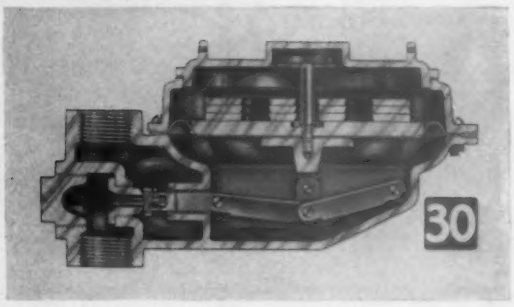

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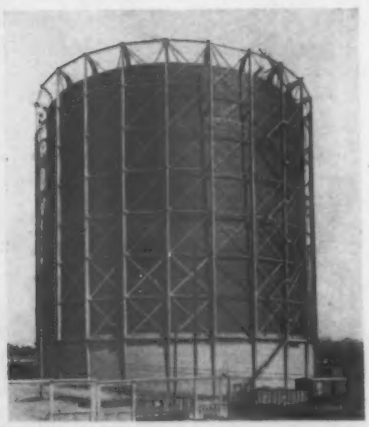

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The Homestead Heater Co. 19

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Roberts-Gordon Appliance Corp. 340

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New Process Stove Co. 260

RANGE CATALOG
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RANGE CATALOG—ORIOLE GAS RANGES
Standard Gas Equipment Corpn. 346
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RANGE CATALOG—ACORN GAS RANGES
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EDITOR, AMERICAN GAS JOURNAL, 53 PARK PLACE, NEW YORK

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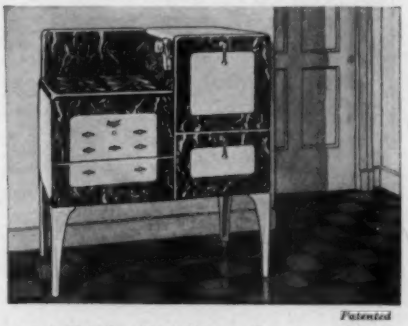

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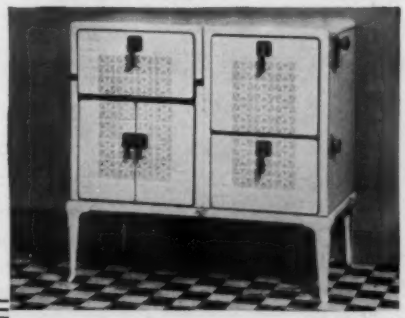

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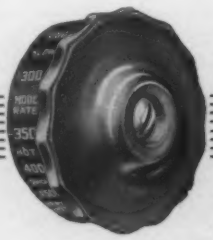

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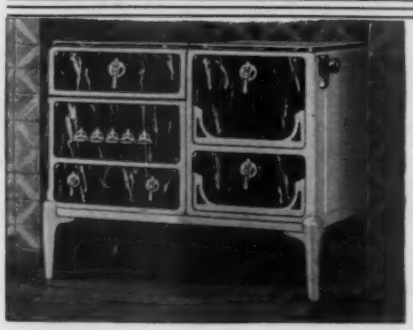

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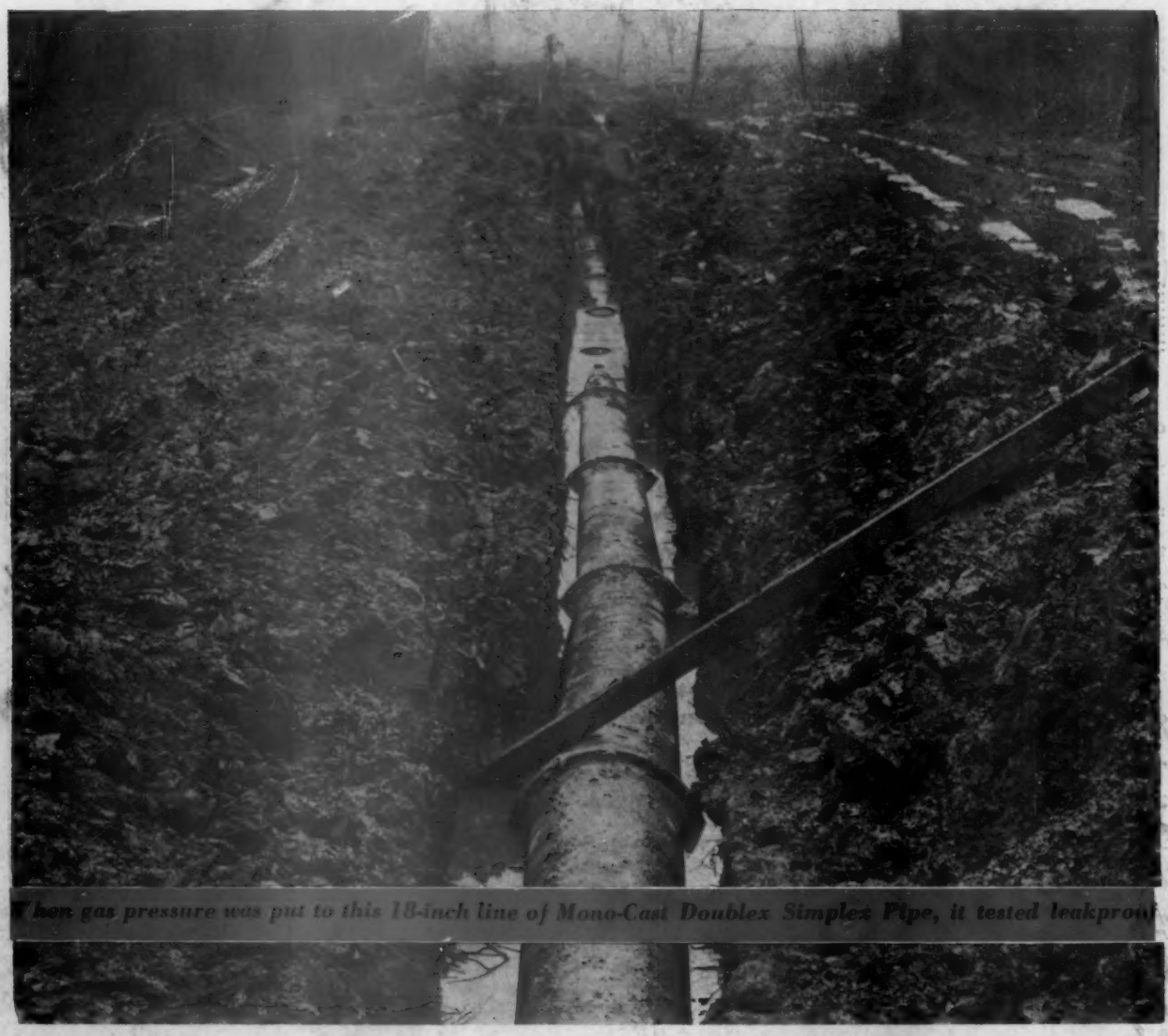

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